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To cite this article: Moran Influs, Maayan Pratt, Shafiq Masalha, Orna Zagoory-Sharon & Ruth Feldman (2018): A social neuroscience approach to conflict resolution: Dialogue intervention to Israeli and Palestinian youth impacts oxytocin and empathy, Social Neuroscience, DOI: [10.1080/17470919.2018.1479983](https://doi.org/10.1080/17470919.2018.1479983)

To link to this article: <https://doi.org/10.1080/17470919.2018.1479983>

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 Accepted author version posted online: 25 May 2018.  
Published online: 12 Jun 2018.

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# A social neuroscience approach to conflict resolution: Dialogue intervention to Israeli and Palestinian youth impacts oxytocin and empathy

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## ABSTRACT

The rapid increase in terror-related activities, shift of battlefield into civilian locations, and participation of youth in acts of violence underscore the need to find novel frameworks for youth interventions. Building on the Israeli-Palestinian conflict and social neuroscience models we developed an eight-week dialogue group-intervention for youth growing up amidst intractable conflict. Eighty-eight Israeli-Jewish and Arab-Palestinian adolescents (16-18years) were randomly assigned to intervention or control groups. Before (T1) and after (T2) intervention, one-on-one conflict interaction with outgroup member were videotaped, oxytocin levels assayed, attitudes self-reported, and youth interviewed regarding national conflict. We tested the hypothesis that dialogue intervention would enhance empathic behavior and increase oxytocin levels following interaction with outgroup member. Intervention increased youth perspective-taking on national conflict. Oxytocin increased from T1 to T2 only for adolescents undergoing intervention who improved perspective taking in the process. Structural equation modelling charted three pathways to behavioral empathy toward outgroup member at T2; via endogenous oxytocin, empathic cognitions, and dialogue intervention; however, an alternative model without the intervention arm was non-significant. Our findings highlight the important role of empathy in programs for inter-group reconciliation and support evolutionary models on the precarious balance between the neurobiology of affiliation and the neurobiology of outgroup derogation.

## ARTICLE HISTORY

Received 5 November 2017  
Revised 20 April 2018  
Published online 12 June 2018

## KEYWORDS

Empathy; oxytocin; conflict resolution; youth intervention; randomized controlled trial; adolescence



## Introduction


Intergroup conflicts – among races, cultures, religions, and nations – abound around the globe and youth participation in inter-group conflict increases each year in staggering numbers (Taylor, Merrilees, Goeke-Morey, Shirlow, & Cummings, 2016). Intractable conflicts are kept alive by extreme groups who maintain ongoing violence through repeated hatred propaganda directed specifically to the young ear (Neer & O'Toole, 2014) and social media similarly plays a key role in youth involvement in political violence (Pauwels & Schils, 2016). With the recent shift of battlefield into the heart of civilian locations, the growing participation of youth in armed conflict has become a world-wide concern (Kohrt et al., 2016). In such downward spiral toward greater hostility and younger ages of participation, building interventions to contain youth participation in inter-group aggression has become a pressing international goal.

Among the most intractable conflicts globally is the Israeli-Palestinian conflict, generating suffering, aggression,

and violence for over a century (Bar-Tal, 2007). Youth participation in this conflict increased dramatically in recent years and greater hatred, ethnocentrism, and despair has been reported by adolescents on both sides (Bargal, 2004). The conflict also juxtaposes two people with vastly different representational worlds, including history, religion, codes of honour, attitudes, and future perception, and very few opportunities for real-life social encounters are currently available for teenagers.

Most existing interventions for Israeli Jews and Arabs involve adults, mainly students (Abu-Nimer, 2004; Kampf & Stoler, 2015; Steinberg, 2004), some involve kindergarten (Cole et al., 2003) or elementary-school children (Berger, Abu-Raiya, & Gelkopf, 2015; Deeb, Segall, Birnbaum, Ben-Eliyahu, & Diesendruck, 2011), and very few address adolescents (Bargal, 2008). Most interventions involve a single session (Nasie, Bar-Tal, Pliskin, Nahhas, & Halperin, 2014) and lack unbiased assessment of outcome. Yet, despite the fact that adolescence is a period of vulnerability to intractable conflict, interventions for this age are lacking.

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 The supplemental data for this article can be accessed [here](#)

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Adolescents are more susceptible to hatred propaganda compared to both children and adults (Somasundaram, 2002), unable to perceive multiple views on political conflicts (Adelson & O'neil, 1966), and are prone to cognitive biases and prejudice (Bar-Tal & Labin, 2001). Authors have emphasized the need to build interventions for adolescents that involve personal encounters, enhance empathic behavior, and increase perspective-taking (Maoz, 2004; Morray & Liang, 2005). Thus, our Tools of Dialogue© intervention was built to address these goals and targeted adolescence, a period of identity formation marked by rapid brain maturation, strides in social cognition, and growing awareness of social issues (Blakemore & Mills, 2014; Crone & Dahl, 2012).

Advances in social neuroscience may contribute to understanding intergroup conflict and direct intervention effort. Imaging studies found attenuated neural response to the physical and emotional pain of outgroup compared to ingroup targets, for instance, reduced activation in the “pain matrix” (AI, ACC, and mOFC) to other versus own race (Azevedo et al., 2013; Mathur, Harada, Lipke, & Chiao, 2010; Xu, Zuo, Wang, & Han, 2009). Using magnetoencephalography, Levy et al. (2016) found that Israeli and Palestinian youth responded automatically to the pain of both ingroup and outgroup targets in sensorimotor cortex (S1), a key area of pain empathy (Lamm, Decety, & Singer, 2011). Yet, response to outgroup pain was blunted after 500ms, indicating that top-down cognitive control mechanisms intervene to shut down the brain's automatic empathic response. This neural ingroup bias to the pain of ingroup versus outgroup was impacted by lower behavioural empathy during one-on-one interaction with outgroup member and attitudes that justice was solely on one's side. Thus, if the shut-down of the brain's empathic response may be reversed by accepting attitudes and empathic behaviour, interventions that bolster empathic behaviours and increase perspective-taking may help activate the neural basis of empathy.

Research on the oxytocin (OT) system and its critical role in supporting affiliation on the one hand (Feldman, 2012a) and sustaining ethnocentrism and outgroup derogation on the other (De Dreu, Greer, Van Kleef, Shalvi, & Handgraaf, 2011), provides additional neuroscience angle on reconciliation. OT is an ancient peptide whose role across animal evolution has been to supports life in harsh ecologies by enabling organisms to collaborate but also to immediately distinguish friend from foe (Feldman, Monakhov, Pratt, & Ebstein, 2016). OT is implicated in processes that enable humans to form groups, understand social signals, and participate in social life but also to derogate and exclude outgroup members (De Dreu, 2012; Feldman, 2012a). Such OT-supported

outgroup derogation relies on the fear and tension elicited by contact with outgroup (De Dreu et al., 2011), which blocks the effects of OT on social reciprocity, friendship, and group-formation (De Dreu & Kret, 2016; Feldman, 2012a). The OT system supports cognitive and emotional empathy (Feldman et al., 2016; Hurlemann et al., 2010) as well as behavioral empathy during interaction (Priel, Djalovski, Zagoory-Sharon, & Feldman, 2018). Cognitive and behavioral empathy mark the two arms of empathy (Hoffman, 2001) and perspective-taking is a key feature of cognitive empathy, enabling individuals to see others from their own “shoes”. In the context of the Israeli-Palestinian conflict, OT administration has been shown to promote self-reported empathy to the pain of outgroup (Shamay-Tsoory et al., 2013).

With regards to the neurobiology of conflict resolution, our *biobehavioral synchrony* model (Feldman, 2016, 2017) highlights the key role of OT in providing the neurobiological substrate for affiliation and suggests that human empathic behavior and the neural basis of empathy develop through reciprocal dialogue via bottom-up behavior-based pathways, originating in the mother-infant bond. These reciprocal social behaviors activate both the OT system (Feldman, 2012a) and the brain basis of empathy (Abraham, Raz, Zagoory-Sharon, & Feldman, 2017). Longitudinal studies show that reciprocal interactions in infancy predict empathic behaviors (Feldman, Bamberger, & Kanat-Maymon, 2013), increase cognitive empathy (Feldman, 2007) and tune the neural basis of empathy in adolescence (Pratt et al., 2017). Thus, youth intervention amidst intractable conflict may benefit from adapting a behavior-based model and focus on behavioral empathy, enhance empathic cognitions and perspective-taking, and increase reciprocity to reduce tension and hostility. Such approach can enable the neurobiology of empathy to triumph over a just-as-powerful neurobiology of outgroup fear, both emanating from the same ancient systems.

The current study implemented the Tools of Dialogue© intervention – a manualized, behavior-based intervention for Israeli and Palestinian youth focusing on the enhancement of perspective taking and behavioral empathy – within a randomized controlled, fully-blind, parallel assignment study. Behavioral empathy defines social behavior that acknowledges others' communications without the need to share their views (Zahavi & Rochat, 2015), engages in give-and-receive meaningful and respectful exchange, expresses verbal and non-verbal empathy to the other's distress and emotions, maintains positive affect and visual contact, and elaborates on the partner's signals and topics. Youth were randomized into intervention and control groups with pre- and post-intervention assessments.

Three hypotheses were formulated: First, consistent with previous intervention studies (Steinberg, 2004), we hypothesized that the intervention will impact youth perspective taking (PT) on the national conflict, reducing the tendency to view justice only on one's side. Thus, youth in the intervention group would report greater ability to perceive justice on the other side at T2 compared to controls. Second, we hypothesized that following intervention youth would exhibit higher OT levels and greater behavioral empathy at T2 compared to controls. Because change in PT often leads to a cascade resulting in greater empathy (Batson, Early, & Salvarani, 1997), we expected that PT would moderate the degree to which intervention increased OT and improved behavioral empathy. Finally, we suggest a 3-path model charting the multi-dimensional pathways that lead to behavioral empathy toward outgroup and tested it using structural equation modeling. First, individual differences in OT functionality will shape empathy so that youth with higher OT levels at T1 and greater PT will show more empathic behavior at T2 consistent with prior research (Feldman, 2012a). Second, dispositional cognitive empathy at T1 (tested by the self-report measure IRI) will predict greater behavioral empathy at T2, both directly and as mediated by reduction in ethnocentric attitudes, consistent with studies showing links between empathy and ethnocentrism in the context of the Israeli-Palestinian conflict (Levy et al., 2016). Finally, the intervention would impact empathy by initiating a cascade that begins with increasing PT,

which, in turn, will lead to reduction in tension during interaction with outgroup, culminating in greater empathy during face-to-face encounter.

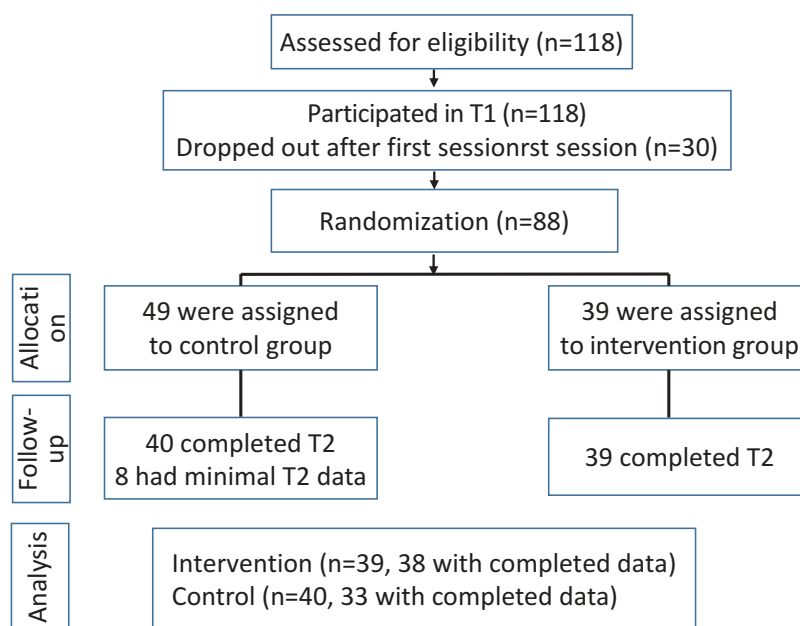
## Method

### Participants

Eighty-eight healthy Israeli-Jewish and Palestinian teenagers participated in the study, with equal number of Jews, Arabs, boys, and girls. Participants were without any serious medical or neurodevelopmental conditions and attended regular national high-schools. Participants were recruited through social networks, school principals, and youth centers and parental consent was obtained. Adolescents were between 16–18 years ( $M = 16.54$ ,  $SD = .77$ ). Subjects were randomly assigned to experimental and control groups using computer-generated list of random numbers, controlling gender and nationality. The RCT is registered with the U.S. Clinical Trials Registry (NCT02122887; <https://clinicaltrials.gov>). Flow chart of group assignment, allocation, and follow-up appears in Figure 1. The study was conducted at Bar-Ilan University, Israel between February 2013 and November 2015.

### Ethical considerations

Study was approved by the Ethics committee of Bar-Ilan University, conducted according to ethical guidelines, and all participants and their parents signed informed consent. Our intervention did not involve any medication, deception, or aversive stimuli presentation and no



**Figure 1.** Flow chart of group assignments, allocation, and follow-up assessment.

potential harm was expected. Youth were informed that they can leave at any point during each session or drop out of the study.

### **Intervention development and fidelity**

Development of the Tools of Dialogue© Intervention followed lengthy discussions and feedback from Israeli-Jewish and Palestinian professionals who are leaders in directing Jewish-Arab co-existence youth groups. The overall intervention and session topics appear in Figure 2. Four groups were conducted – two boys groups and two girls groups-led by two professionals, Israeli-Jewish and Arab-Palestinian, with many years of experience in such groups. We conducted same-gender groups only in light of our consultants' feedback on the need to prevent religious inconvenience for religious Islamic participants. Sessions were held weekly for eight consecutive weeks and each lasted two hours. Sessions began and ended in a circle setup and opened with a joint activity/ritual. Leaders invited each participant to share his/her feeling after the last session or in the current session, bring up tension-eliciting topics, and provide feedback that elicit closeness and empathy.

Following, the topic of each session was introduced, followed by activities, games, and guided imagery that focused on how to approach this topic with empathic cognitions and behaviors (for example, the topics of "conflict", "prejudice" "dialogue"). Each session included opportunities for dyadic dialogues between participants from the two groups, as well as whole group dialogues mediated by the leaders where participants were encouraged to share family history, personal suffering related to the conflict, and the impact of the national conflict on their daily life.

Participants also had the opportunity to experience empathy to the other group using role playing, songs, and videos. The intervention ended with two summary sessions in which youth expressed their "needs" from the other side, formulated practical suggestions for inter-group communication, described their personal experience in the group, and expressed future hopes at the personal and community levels. The last activity in the intervention was a metaphorical "gift giving" to the group.

To assure fidelity, we developed a detailed manual for each session's activities and sessions were videotaped. The same two group leaders conducted all four groups. Developers of the intervention held weekly meeting with group leaders and fidelity checks were conducted using the videos.

### **Pre-and post-intervention assessment**

Identical visits were conducted at baseline (T1) and after intervention or after 3 months for controls (T2), with a similar time-lag between T1 and T2 across groups. Each assessment included one-on-one interactions, hormonal collection, MEG, in-depth interview, and self-reports. To assure blind assessment, intervention leaders or assistants did not participate in data collection, coding, or analysis and all information was kept masked until the end of trial and data analysis stage.

### **Measures**

*Conflict interactions.* In one-on-one session with same-sex outgroup member, participants engaged in conflict discussion paradigm, where they discussed a

<b>Tools of Dialogue© Group Sessions</b>							
Session 1	Session 2	Session 3	Session 4	Session 5	Session 6	Session 7	Session 8
<b>Familiarity</b>	<b>Affiliation</b>	<b>Conflict</b>	<b>Prejudice</b>	<b>Dialogue</b>	<b>Empathy</b>	<b>Conclusions</b>	<b>Commitment</b>
Personal introduction	Tradition Culture dialogues	Defining Conflict	Personal Experience of National Conflict	Historical Narratives	Defining Empathy	Group Needs and National Goals	Concluding Personal Experience
Finding Similarities		Personal Conflicts	Family Interviews	National Conflict "Hot issues"	Practical Applications across Relationships	Hopes for the future	Farewell and Metaphorical Gift Giving
Dyadic Interviews of Outgroup	My Family within my Ecology	Ways for Resolving Personal Conflict	What is Prejudice	Conflict Resolution	Practicing Empathy	Practical Suggestions	Summary of Group Leaders

**Figure 2.** The tools of dialogue intervention.

conflict of their choice for 7 minutes, consistent with prior research (Feldman et al., 2013; Feldman, Rosenthal, & Eidelman, 2014). Participants were able to choose the national conflict as the topic of discussion or any other conflict in their lives (with parents, teachers, etc). Interactions were coded with the Coding Interactive Behaviour (CIB) manual, adolescent version, a well-validated system for coding interactions with good psychometric properties (see Feldman, 2012b for psychometric measures of the CIB). The adolescent CIB includes 32 codes rated on a scale of 1 to 5 that are aggregated into several constructs. Two constructs were used here: **Behavioral Empathy**- this construct, the focus of our study, combines verbal and non-verbal behaviors that index cognitive empathy (understanding other's views, thoughts, and feelings) and emotional empathy (acknowledging other's messages, sharing emotions, resonance, and reciprocity). It was calculated as the average of the following CIB codes: expressing empathy by sharing feelings and showing concern (emotional empathy/resonance); acknowledging other's communication, elaborating the other's topics, thoughts, emotions, and ideas thus showing the ability to adapt the other's perspective (cognitive empathy); maintaining positive affect, maintaining visual contact, and give-and-receive reciprocity, and **Dyadic Tension** – averaged the CIB codes of displaying tense, anxious, and uneasy behaviour, fear, and constriction of communicative output and social behavior. Coders were blind to all other information. Inter-rater reliability conducted on 15 interactions, averaged 93% ( $\kappa = .87$ ).

**Oxytocin.** Three saliva samples were collected using Salivettes® (Sarstedt, Rommelsdorf, Germany) at baseline, following interaction, and ten minutes after end and averaged. All samples were then stored at  $-20^{\circ}\text{C}$ . Salivette were treated as following: centrifuged twice, at  $4^{\circ}\text{C}$  at  $1500 \times g$  for 30 minutes, aliquoted and lyophilized over few days- to concentrate by 4 times. The dry samples were reconstructed in the assay buffer immediately before analysis using an OT enzyme immunoassay commercial kit (ENZO, NY). The assay performed according the kit's instruction. The concentration of OT was calculated using MatLab-7. The intra- and inter-assay coefficients of variation (CV) were less than 12.9% and 18.8%, respectively. Seven participants at T1 (3 intervention, 4 control) and 4 at T2 (2 intervention, 2 controls) did not have all 3 OT samples, due to insufficient saliva, and scores were averaged from valid assessments.

**In-depth interview.** Participants were interviewed individually on their attitudes towards the Israeli-

Palestinian conflict, potential solution, and justice perception. Perspective-taking (PT), our key construct, measures cognitive empathy, addressed the degree to which adolescents thought justice was solely on their side and the other side is wrong, aggressive, and vicious compared to the ability to see some justice on both sides. Participants received a binary score for PT. Participants with low PT believe that justice is solely on their side and the other side has no valid claims. Participants with high PT were able to see that the conflict is complicated and that there is justice on both sides of the conflict.

**Interpersonal Reactivity Index (IRI)** (Davis, 1980) The instrument contains four seven-item subscales, tapping facets of empathy. We used the perspective-taking subscale, assessing tendency to spontaneously adopt viewpoints of others in everyday life (i.e.: "I sometimes try to understand my friends better by imagining how things look from their perspective"). Internal consistency (Cronbach's  $\alpha$ ) for the PT scale is .75 for men and .78 for woman.

**Ethnocentrism Scale** (Neuliep & McCroskey, 1997). This Revised Ethnocentrism Scale contains 22 items with 15 scored and 7-mark balance between numbers of positively and negatively-worded items. Each Item is scored on a scale from 1 to 5, 1 is strongly disagree and 5 is strongly agree. Reliability of the scale (Cronbach's  $\alpha$ ) is .92 (Neuliep, 2002).

**Post-group narrative** – Group participants were interviewed about their experience. On scale of 1–4, **Personal change**-measured the degree to which intervention led to new knowledge or enhanced personal growth, and **Effectiveness**-degree to which intervention was experienced as effective.

## Statistical analysis

We first measured PT change following intervention. Next, we assessed change in OT and behavior as a function of intervention and PT using repeated-measure ANOVA. Pearson's correlations measured associations among study variables. Structural Equation Modelling was used to test paths to empathic behavior toward outgroup. The model was tested using AMOS19 software (Arbuckle, 2009). Model fit was assessed using the following goodness-of-fit indices (see Hu & Bentler, 1999): Chi-square (Tabachnick & Fidell, 2007), Normed Fit Index (NFI, Bentler & Bonett, 1980), Comparative Fit Index (CFI; Rigdon, 1996), and Root-Mean-Square Error of Approximation (RMSEA; Browne & Cudeck, 1993). A non-significant chi-square, and NFI, CFI, or TLI equal to or greater than .95, and an RMSEA less than or equal to

.07 (Hu & Bentler, 1999; Tabachnick & Fidell, 2007) reflect a good fit between the model and the data.

## Results

Primary analyses involved all participants who were randomly assigned and completed the study (N = 79; Intervention = N = 39, Control = N = 40).

### Perspective-taking

No group differences were found in PT at pre-intervention ( $\chi^2(1) = .01$ , NS), with 52.5% controls and 53.8% intervention youth maintaining that justice is solely on their side. Following intervention, those undergoing intervention (62.5%) were more likely to see justice on both sides, compared to only 38.6% among controls,  $\chi^2(1) = 4.57$ ,  $p < .05$ ; Cramer's V = .24, attesting to our first goal of enhancing cognitive empathy.

### Group differences in OT and behavior

Means and SD of all study variables according to group appear in Table 1.

*Behavior during conflict dialogue with outgroup member:* For *Empathy*, main effect emerged for PT;  $F(1,75) = 5.16$ ,  $p < .05$ ,  $\eta^2 = .07$ ; youth higher in PT

displayed more empathy toward outgroup (M = 3.37, SD = .12) than those low in PT (M = 3.03, SD = .12) (Figure 3), but no time, group, or interaction effects were found.

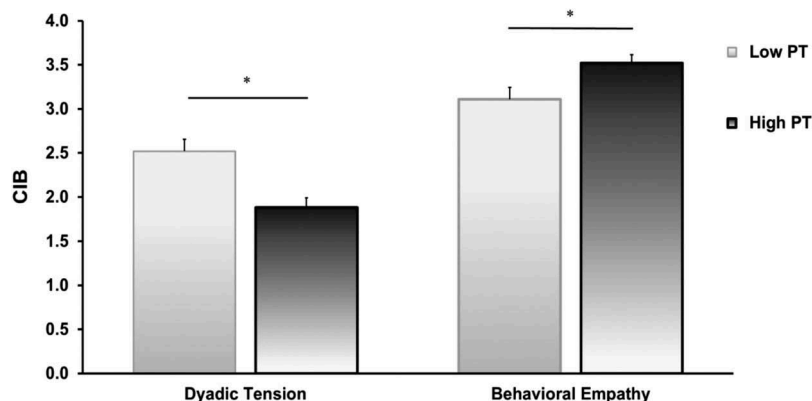
Main effect for time emerged for *Dyadic Tension*;  $F(1, 75) = 9.89$ ,  $p < .01$ ,  $\eta^2 = .13$ ; tension decreased when teenagers met outgroup member the second time: T1; M = 2.39, SD = .12, T2; M = 2.08, SD = .09. Main-effect also emerged for PT:  $F(1, 75) = 7.06$ ,  $p < .01$ ,  $\eta^2 = .09$ ; youth endorsing some justice in other side displayed lower tension; M = 1.98, SD = .14, than self-righteous youth; M = 2.49, SD = .14 (Figure 3).

*Oxytocin.* No significant main effects emerged for OT, but a three-way interaction of time, PT, and intervention was found  $F(1,75) = 6.21$ ,  $p < .05$ ,  $\eta^2 = .08$ . Post-hoc analysis shows that for individuals in the control group the interaction between PT and time was not significant ( $F(1,29) = .72$ , ns,  $\eta^2 = .02$ ). Yet, for individuals in the intervention group the interaction between PT and time was significant ( $F(1,36) = 25.29$ ,  $p < .001$ ,  $\eta^2 = .41$ ), so that individuals with high PT showed a significant increase in OT from T1 to T2 (mean difference = -11.59, SE = 4.78,  $p < .05$ ), while individuals with low PT showed a significant decrease (mean difference = 27.97, SE = 6.25,  $p < .001$ ) (Figure 4).

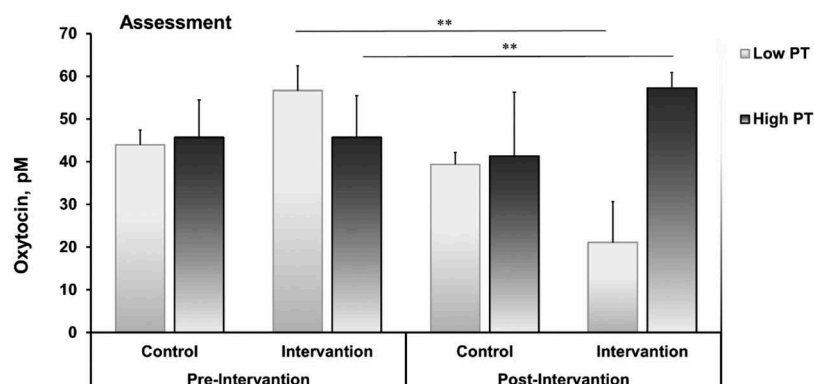
Associations among study variables appear in Table 2. OT was individually stable across assessment. Cognitive empathy (IRI) negatively correlated with ethnocentrism and positively with behavioral empathy. Ethnocentrism was negatively related to behavioral empathy and positively to tension. Dyadic tension negatively correlated with behavioral empathy. As PT is a dichotomous variable multiple independent t-tests were conducted to examine its relation to the study variables, results are presented in Table 3. As seen, youth with high PT display lower levels of tension and ethnocentrism, and higher levels of behavioral empathy, than individuals with low PT.

**Table 1.** Means and SDs of study variables according to group.

	Control		Intervention		T-test	Cohen's d
	Mean	SD	Mean	SD		
Oxytocin pre-intervention	44.08	26.67	49.93	34.41	-.80	.19
Oxytocin post-intervention	40.03	57.43	43.42	35.34	-.31	.07
IRI	18.23	3.75	19.04	3.87	-.95	.21
Ethnocentrism	37.25	8.75	36.74	9.24	.25	.06
Dyadic tension	2.26	.81	2.15	.87	.59	.13
Behavioral empathy	3.33	.76	3.29	.79	.23	.05



**Figure 3.** Dyadic tension and behavioral empathy in youth high vs. low in perspective-taking.



**Figure 4.** Oxytocin levels at pre- and post-intervention according to group and perspective-taking.

**Table 2.** Correlations among study variables.

	2	3	4	5	6	7
1. Oxytocin pre-intervention	.44***	-.09	-.16	.05	.07	-.19
2. Oxytocin post-intervention		-.07	-.10	.20	-.15	-.004
3. IRI			-.25*	.22*	.07	.22*
4. Ethnocentrism				-.50***	.29*	-.36**
5. Perspective taking					-.24*	.30**
6. Dyadic tension						-.70***
7. Behavioral empathy						

### SEM modelling

SEM model tested our third hypothesis on the paths leading to behavioral empathy. Participants' age and gender were entered as covariates and since PT and OT were both associated with ethnocentrism, these paths were modeled as well. We found three paths leading to post-intervention behavioral empathy. *The neuroendocrine path* led from pre-intervention OT to post-intervention OT, which led to higher empathy. *The cognitive-attitudinal path* led from cognitive empathy (IRI) to post-intervention ethnocentrism to behavioral empathy. Lastly, *intervention* led to enhanced PT, which resulted in decreased tension and finally increased behavioral empathy. The model (Figure 5), had good fit to the data:  $\chi^2(27) = 16.05$ , NS; NFI = .93; CFI = 1.00 and RMSEA = .00.

**Table 3.** Variable distribution according to PT.

	Low PT		High PT		T-test	Cohen's d
	Mean	SD	Mean	SD		
Oxytocin pre-intervention	49.06	40.89	45.72	19.64	-.45	.10
Oxytocin post-intervention	31.78	59.38	51.15	30.09	1.81	.41
IRI	17.83	3.44	19.45	4.03	1.93	.43
Ethnocentrism	41.33	8.15	32.56	7.48	-4.97***	1.12
Dyadic tension	2.52	.85	1.88	.70	-3.63**	.82
Behavioral empathy	3.11	.86	3.52	.61	2.46*	.55

While IRI was associated with behavioral empathy at T2 (Table 2), this correlation was attenuated within the whole model. We thus examined possible mediation via ethnocentrism. Bootstrapping mediation tests for direct and indirect effects were conducted with 2000 bootstrap samples. Results indicated significant mediation effect, so that IRI is fully mediated by ethnocentrism in predicting behavioral empathy (direct effect without mediator:  $r = .15$ ,  $p < .05$ ; direct effect with mediator:  $r = .08$ , NS; indirect effect:  $r = .06$ ,  $p < .05$ ). This implies that the effect of adolescents' general cognitive empathy on their behavioral empathy toward outgroup members is mediated by their ethnocentric attitudes.

To highlight the effects of the intervention, we examined alternative more parsimonious model without the intervention path. This model did not have an acceptable model fit ( $\chi^2(34) = 142.81$ ,  $df = 34$ ,  $p < .001$ , NFI = .37, CFI = .40, RMSEA = .20) (Supplementary Figure 1), and its fit to the data was significantly worse than the original model;  $\chi^2(7) = 126.76$ ,  $p < .001$ .

### Personal change following intervention

Adolescents reporting personal change exhibited more empathy toward outgroup at T2;  $t(37) = -2.41$ ,  $p < .05$  ( $M = 3.48$ ,  $SD = .66$  versus  $M = 2.86$ ,  $SD = .91$ ). Similarly, youth perceiving intervention as effective showed higher empathy;  $t(37) = -3.05$ ,  $p < .01$  ( $M = 3.44$ ,  $SD = .65$  versus  $M = 2.47$ ,  $SD = 1.01$ ).

### Discussion

We developed a novel eight-week group intervention for youth growing up in zones of intractable conflict and tested it within a randomized controlled trial. Guided by evolutionary and social neuroscience models, we focused on the individual's affiliation matrix, behavioral aspects of dialogue, conflict resolution, and perspective-taking as pathways to change and



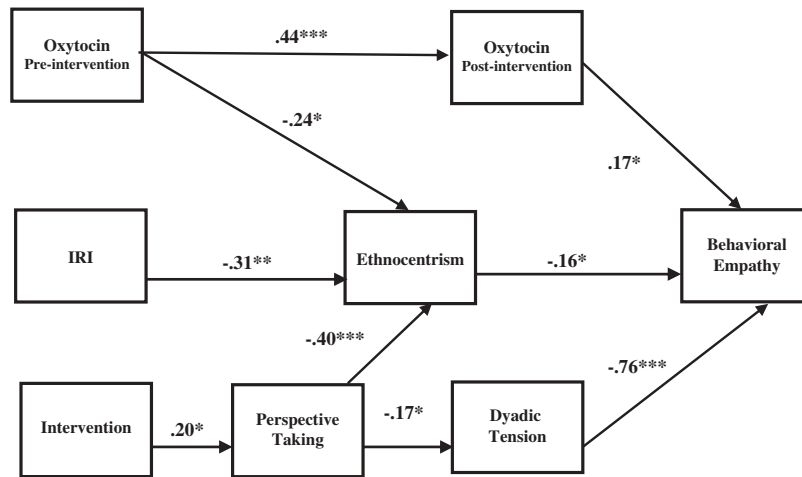


Figure 5. SEM model.

- Only significant paths are presented.

enhancement of empathy. Three major insights emerged from our effort, the first RCT for adolescents growing up within political violence. First, while all participants acknowledged the importance of the intervention, its effects were, in the main, subtle. It appears that the intervention initiated a cascade beginning with the enhanced capacity for perspective-taking, leading to reduction of fear and tension, and culminating in higher behavioral empathy during one-on-one encounter with outgroup member. Second, the effects of intervention on OT levels, the neuroendocrine substrate of empathy, were similarly nuanced. Only among youth who participated in the intervention and improved their perspective-taking in the process, OT increased from pre- to post-intervention, linking OT change with reduction in the adolescent's "us versus them" attitude. Finally, while greater cognitive empathy, measured by self-reports, correlated with higher behavioral empathy, this link was fully mediated by ethnocentricity, paralleling the neuroscience finding on the attenuation of neural empathy in more ethnocentric youth (Levy et al., 2016). Overall, our results chart a three-path model for enhancing empathic behavior in youth within political conflict and the alternative non-significant model indicates that the intervention was an indispensable component of change. As our study was conducted during extremely tense period in the region, the courage to continue attending despite enormous hatred propaganda is in of itself a sign of strength and hope.

Violence, aggression, and struggle over resources have characterized our species since early hominin evolution. At the same time, empathy to the distress of

conspecifics is an evolutionary-ancient phenomenon; it is observed in rodents (Bartal, Decety, & Mason, 2011) and primates (Boesch, 1992), relies on mimicry and sensorimotor resonance (Decety & Meltzoff, 2011), is enhanced by familiarity (Donaldson & Young, 2008), and shuts down when the sufferer is member of an outgroup (Feldman, 2017). Human empathy evolved from these ancient roots to include cognitive flexibility and interoceptive representations, clear differentiation of self and other, and networks supporting affective representations, not merely sensory-motor resonance (Zaki, Ochsner, Hanelin, Wager, & Mackey, 2007). Our approach ingrates evolutionary and social neuroscience models with phenomenological thought, particularly Levinas' (Levinas, 1987) notions on the face-to-face position as affording the only context for true meeting with the Other. Accordingly, our youth learned that empathy involves meeting the other without the need to share their views, as each individual got the chance to fully discuss his/her perspective, feelings, and needs from the other side.

Our model was based not only on cognitive understanding but also on acts of sharing and behavioral synchrony: role playing, joint rituals of dyadic conversations, gift giving, and group games which required collaboration and consideration. Social synchrony has been a powerful mechanism to enhance group cohesion since early human evolution in activities such as marching, joint harvesting, or choral singing (Wilson, 2012). While there are other interventions to reduce inter-group hatred, such as mindfulness, cognitive behavior therapy (Berger, Gelkopf, Heineberg, & Zimbardo, 2016) or forgiveness (Shechtman, Wade, &

Khoury, 2009), we chose to focus on behavioral empathy that is based on actual acts of reciprocity, emotional resonance, and acknowledgement.

While we integrated into our intervention aspects from both the confrontation (Tajfel & Turner, 1986) and contact (Allport, 1954) approaches to conflict resolution, our social neuroscience-informed model differed in meaningful ways from these models. Unlike prior interventions, we aimed to enhance the expression of behavioral empathy not by quarrelling national identities (“confrontational approach”) or getting acquainted (“contact approach”). Our pathway to change was via eliciting concrete behaviors that promote mammalian sociality and reduce aggression in order to activate the neurobiology of affiliation while suppressing the neurobiology of fear and exclusion. As such, participants learned about the suffering of the other side, were encouraged to ask harsh question while utilizing a dialogical mode of conversation, and practiced how to dialogue conflict while expressing respect and emotions. Thus, our findings on the pathways leading to greater empathy when confronting a potentially threatening outgroup member can expand theory and research on the roots of human empathy.

The association found between OT and behavioral empathy is consistent with much research indicating that individuals with higher endogenous OT show greater behavioral reciprocity and empathy (Feldman, 2012a). OT was found to be individually stable across lengthy periods (Feldman, Gordon, Influs, Gutbir, & Ebstein, 2013), thus, the link from initial levels of OT at T1 to the correlations between OT and behavioral empathy at T2 may ride on the stability of OT over time. According to the *biobehavioral synchrony* model, the child’s OT system is tuned during early sensitive periods to social life through sensitive well-adapted parenting (Feldman, 2015, 2016). Interestingly, among controls or those receiving intervention but failing to increase perspective taking, those who perceive justice in “black-and-white” terms, OT decreased from T1 to T2. Such decrease may be consistent with the social salience hypothesis on OT (Shamay-Tsoory & Abu-Akel, 2016), which suggests that social novelty increases OT. For those who received the intervention and increased perspective taking, but not for others, the interaction with outgroup member may have moved from mere “novelty” to true reciprocal interaction that can trigger OT release (Feldman, Gordon, Schneiderman, Weisman, & Zagoory-Sharon, 2010).

The path leading from intervention to behavioral empathy highlights the increase in PT as a key feature of the intervention that reverberated in the adolescents’ negative and positive nonverbal behavior. This

underscores the need to focus educational efforts on familiarity with the other side’s narrative, sense of justice, history, culture, and belief-system as the road to behavioral change. Findings also demonstrate that the link from PT to empathy was indirect, passing through the reduction in fear and tension from outgroup members. This is consistent with research on the two-pronged role of the ancient OT system; maintaining social vigilance to quickly detect enemies and providing quiescence for the formation of affiliative bonds (Carter, 2014). Only when tension decreased, youth were able to feel sufficiently safe to engage in non-verbal reciprocity and online attention to the communicative signals of their outgroup partner. The link between PT and empathy was also mediated by ethnocentrism. The increase in self-other overlap that is caused by the increase in PT may reduce ethnocentrism and lead to more positive evaluations of the other (Galinsky & Moskowitz, 2000).

Finally, the third path to behavioral empathy originated from the individual’s dispositional cognitive empathy. Yet, the finding on mediation is important in the present context and indicates that even youth with high dispositional empathy may not behave empathically to outgroup members if they embrace ethnocentric attitudes. Ethnocentricity, the division of people into “us versus them”, is greatly enhanced by ongoing conflict and marks a clear barrier to change. It is also a peril of youth who tend to divide the social world into “good” and “bad” associated with ingroup/outgroup membership (Teichman, 2001). Our findings show that ethnocentricity may block the capacity for behavioral empathy even among youth who report high cognitive empathy and highlight the need to combat ethnocentricity via youth interventions.

Finally, limitations of the study should be mentioned. Our findings need to be interpreted with caution and studies of larger numbers are required before generalizations can be made. We did not compare the effects of two different interventions and thus it is not possible to fully tease apart the effects of dialogue intervention from those of familiarity. It is also important to note that aspects other than empathy are important for inter-group interventions, such as methods that enhance forgiveness, compassion, and reconciliation. Much further research, theory-building, and intervention efforts must be directed to assist youth amidst conflict. We need to further understand the mechanisms of change and its neural correlates, how sociodemographic and cultural factors impact change following intervention, and what are the best ways to educate the citizens of tomorrow’s world to be empathic to

the other's distress and manage conflicts with respect and dialogue.

## Acknowledgments

We greatly appreciate the contribution of Hajer Masarwah and Eliana Almog, our wise, committed, and sensitive group leaders; Tal Paz and Dafna Lustig, our devoted research coordinators; Naama Bonder, Aya Shaib, Yasmeena Sarsour for their commitment and hard work; Dr. Adnan Kader, the insightful high school principal in Kafar Kasem; and the adolescents who had the courage to persist and change.

## Disclosure statement

No potential conflict of interest was reported by the authors.

## Funding

This work was supported by the Fetzer Foundation [001].

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