

## Applying imagined contact to improve physiological responses in anticipation of intergroup interactions and the perceived quality of these interactions

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### Abstract

This experiment ( $N = 49$ ) is the first to show that imagined contact can buffer anticipatory physiological responses to future interactions, and improve the quality of these interactions. Participants imagined a positive interaction with a person with schizophrenia, or in a control condition, a person who did not have schizophrenia. They then interacted with a confederate whom they believed had schizophrenia. Participants in the imagined contact condition reported more positive attitudes and less avoidance of people with schizophrenia, displayed smaller anticipatory physiological responses, specifically smaller changes in interbeat interval and skin conductance responses, and had a more positive interaction according to the confederate. These findings support applying imagined contact to improve interactions with people with severe mental illnesses.

Globally, there are hundreds of millions of people with one or more mental health disorder (World Health Organization, 2010). As well as the difficulties imposed by the conditions themselves, these people also face severe and pervasive mental health-related prejudice (London & Evans-Lacko, 2010). This prejudice is not only found in the lay community (Couture & Penn, 2003; Holmes, Corrigan, & Williams, 1999) but also among medical and mental health personnel (Schulze & Angermeyer, 2003) and can negatively affect their professional lives (Marwaha & Johnson, 2004), personal lives, and quality of healthcare (Schulze & Angermeyer, 2003; Sylvestre, Nelson, Sabloff, & Peddle, 2007). Furthermore, prior research has found that the associated stigma varies according to diagnostic label (Sadler, Meagor, & Kaye, 2012), and that people with schizophrenia suffer from socially accepted (West & Hewstone, 2012), and especially severe (Crisp, Gelder, Rix, Meltzer, & Rowlands, 2000; Crisp, Gelder, Goddard, & Meltzer, 2005) stigmatization. Even among groups with mental health disorders, they are seen as particularly dangerous and are particularly feared (Angermeyer & Matschinger, 2003; Angermeyer & Schulze, 2001; Crisp et al., 2000, 2005; Read, 2007).

Intergroup contact, or interaction with a member of another group, is one of the most widely used and reli-

ably effective social-psychological interventions for reducing prejudice (Allport, 1954; Pettigrew & Tropp, 2006). However, despite intergroup contact's ability to reduce prejudice against people with mental health disorders (Couture & Penn, 2003; Evans-Lacko et al., 2013), and specifically people with schizophrenia (West, Hewstone, & Lollot, 2014), opportunities for identifiable contact are rare, partly because sufferers tend to hide their condition to reduce the associated stigmatization (Schulze & Angermeyer, 2003).

Extended intergroup contact—knowing or observing members of one's ingroup interact with members of an outgroup—is a potential solution to this problem (Wright, Aron, McLaughlin-Volpe, & Ropp, 1997). A significant body of prior research demonstrates the effectiveness of extended contact (see Turner, Hewstone, Voci, Paolini, & Christ, 2007 for a review), including its ability to improve affective and behavioral responses to people with schizophrenia (West & Turner, 2014). However, extended contact is limited in that it still requires at least one ingroup member to interact with an outgroup member in a way that is both positive and public.

Imagined intergroup contact, however, has no such limitation. It refers to the act of imagining oneself in a social

interaction with a member of another group (Crisp & Turner, 2012). Thus, it combines intergroup contact theory, which shows that interacting with members of other groups reduces prejudice and improves intergroup relations (Allport, 1954; Pettigrew & Tropp, 2006), with research demonstrating that mental imagery elicits neurological, emotional, and motivational responses similar to real experiences (e.g., Dadds, Bovbjerg, Redd, & Cutmore, 1997; Kosslyn, Ganis, & Thompson, 2006). In brief, it is based on the hypothesis that imagining positive interactions with members of other groups should have many of the same consequences as actually having interactions with members of other groups, including improved attitudes, reduced anxiety, and reduced intergroup bias (Turner, Crisp, & Lambert, 2007).

A substantial body of research now attests to the effectiveness of imagined contact as a prejudice-reducing intervention. Turner et al. (2007) first found that imagined contact reduced prejudice against older adults and gay men. Subsequent research found similar effects of imagined contact on attitudes toward people of different ethnicities and nationalities (Husnu & Crisp, 2010b; Stathi & Crisp, 2008), immigrants (Harwood, Paolini, Joyce, Rubin, & Arroyo, 2011; Vezzali, Capozza, Giovannini, & Stathi, 2012), asylum seekers (Turner, West, & Christie, 2013), people of different religions (Husnu & Crisp, 2010a; Turner & Crisp, 2010; Turner & West, 2012), overweight people (Turner & West, 2012), and people with mental health disorders (West & Bruckmüller, 2013; West, Holmes, & Hewstone, 2011).

Imagined contact has been shown to improve intergroup relations in a variety of ways: improving participants' feelings about members of other groups (Turner, Crisp, et al., 2007; West & Bruckmüller, 2013; West et al., 2011), improving their beliefs about other groups and about their own likely future responses to these groups (Husnu & Crisp, 2010b; Stathi & Crisp, 2008; Turner et al., 2013; West, Husnu, & Lipps, 2015), and improving their behaviors concerning members of other groups, such as behavior in a self-recorded video intended for an outgroup member (Birtel & Crisp, 2012) or attempted seating distance from a potential outgroup member (Turner & West, 2012). Thus far, however, none of these behavioral measures have included an actual subsequent interaction with another person.

Imagined contact has also been shown to reduce explicit prejudice, which is assessed by measures that allow participant self-presentation, as well as implicit prejudice, which is assessed by measures that circumvent attempts at self-presentation (Turner & Crisp, 2010). Research has also ruled out a number of alternative explanations for the effects of imagined contact, including cognitive load, stereotype priming (Turner, Crisp, et al., 2007), demand characteristics (Turner & Crisp, 2010), and generalized positive affect (Stathi & Crisp, 2008).

## Can imagined contact affect physiological responses and subsequent behavior?

Intergroup contact research has been criticized for an excessive focus on majority-member's attitudes as outcome variables (Devine, Evett, & Vasques-Suson, 1996; Dixon, Tropp, Durrheim, & Tredoux, 2010), particularly since the ultimate goal of direct and imagined intergroup contact is improving intergroup relations for both majority and minority group members (Allport, 1954; Pettigrew & Tropp, 2006). Thus, investigations of the usefulness of imagined contact should not be limited to the participants' attitudes, but should include the quality of the subsequent interaction, particularly from the target's perspective (see Devine et al., 1996). This is even more important because these two goals are sometimes misaligned; participants who attempt to appear less prejudiced may inadvertently appear more prejudiced (Plant, Devine, & Peruche, 2010).

Prior research has shown that imagined contact can improve explicit responses to people with schizophrenia (West & Bruckmüller, 2013; West et al., 2011), and that imagined contact can affect participants' self-reported *intended* behaviors toward other groups (e.g., Turner et al., 2013). However, no imagined contact research, with any target group, has investigated whether imagined contact can also improve anticipatory physiological responses to outgroup members or the quality of an *actual* subsequent interaction. Nor has any prior research investigated whether imagined contact has any detectable effects at all from the outgroup *target's* perspective, rather than the (usually majority group) participant's perspective. We note that Stathi and Crisp (2008) did investigate whether imagined contact improved minorities' beliefs about majorities. However, they did not find it to be effective in that study nor is this the same question as that investigated by this current research: whether the changes in majorities' attitudes and behaviors caused by imagined contact are detectable and perceived as positive by the relevant target-group minority members. Thus, this current research adds to the understanding of imagined contact by investigating its effects on physiological responses and a target's perception of the subsequent interaction.

## Physiological responses

Prior research suggests that imagined contact should affect physiological responses. Specifically, research shows that people experience anxiety before and during intergroup interactions (see Stephan & Stephan, 1985). For example, Mendes et al. (2002) found that White participants exhibited more cardiovascular threat responses when interacting with a Black confederate than with a White confederate. However, prior research also shows that prior direct intergroup contact can

reduce some physiological correlates of this anxiety during subsequent interactions. For example, Page-Gould, Mendes, and Major (2010) found that prior intergroup contact (assessed through questionnaires) predicted faster physiological recovery following an interracial task. Very relevant for this current research, West and Turner (2014) found that an extended contact intervention buffered against anticipatory stress responses to a subsequent interaction with a person with schizophrenia and led to more positive interactions with a confederate.

We note that these are not physiological measures of anxiety; the relationship between anxiety and physiological responses is complex and no such direct empirical measures of psychological states currently exist (Cacioppo, Tassinary, & Bernston, 2000). Unsurprisingly there is often a disjunction between explicit measures and physiological correlates of anxiety or stress. For example, Mendes et al. (2002) found a dissociation between self-report measures and physiological responses; despite exhibiting more cardiovascular threat responses, participants reported more positive evaluations of Black confederates than White ones. This highlights the value of physiological measures, which are continuous and covert, and can measure responses to intergroup situations that are resistant to self-presentation (Blascovich, 2000; Cacioppo et al., 2000).

### **Subsequent interaction and the target's perspective**

A substantial body of evidence indicates that arousal, such as feelings of stress, threat, or anxiety, can negatively impact intergroup interactions (for a review see Dovidio, Hebl, Richeson, & Shelton, 2006). While interacting with members of other groups, individuals may be able to modify their explicit and verbal responses, but will find it more difficult to monitor the implicit and nonverbal responses related to changes in their physiological state. These implicit responses have been shown to be superior predictors of a target-group member's perception of an interaction (Dovidio, Kawakami, & Gaertner, 2002). Thus, if imagined contact can buffer physiological stress responses, it should be able to improve the target's perception of an intergroup interaction.

Although no research to date has used genuine subsequent interaction, some research suggests that imagined contact should positively impact future interactions with members of other groups. The broader literature on mental simulation shows that imagery can alter future behavior, ranging from interview performance (Knudstrup, Segrest, & Hurley, 2003) to sporting performance (Feltz & Landers, 1983). Furthermore, imagined contact can improve participants' self-reported intended behaviors (Husnu & Crisp, 2010b; Turner et al., 2013). Imagined contact has also been shown to reduce implicit biases (Turner & Crisp, 2010) which predict nonver-

bal behaviors toward outgroup members (Dovidio et al., 2002). Moreover, West and Turner (2014) found that an extended contact intervention did improve the quality of subsequent interaction via a change in nonverbal behaviors.

Most strikingly, research has revealed some effects of imagined contact on actual behavior. Turner and West (2012) asked participants to imagine a positive encounter with an obese person or a Muslim. Participants were then led to another room and asked to set out chairs for themselves and the relevant outgroup member. Compared to participants in the control conditions, participants who had imagined intergroup contact placed the chairs significantly closer together. Although this experiment did not use any real interaction, seating distance has been used in intergroup research for some time as a behavioral measure of intergroup attitudes (see Word, Zanna, & Cooper, 1974). Furthermore, in a similar experiment, Birtel & Crisp (2012) asked participants to imagine making a video recording introducing themselves to an older adult. Compared to control participants, these imagined contact participants subsequently recorded videos that were of higher quality, in which their communication style was rated as more personal, smoother, and more in-depth.

### **Present research and hypotheses**

We aimed to (1) replicate previous research indicating that imagined contact improves explicit attitudes and desired avoidance of people with schizophrenia (2) expand on this research by investigating whether imagined contact buffers anticipatory stress responses to future contact and (3) go beyond the attitudes of the participant by demonstrating that imagined contact results in a more positive perceived interaction from the perspective of the confederate posing as a target-group member. The latter two have never been demonstrated by any previous research. We also investigated how imagined contact improved subsequent cross-group interaction; that is, whether its effects were mediated by changes in explicit attitudes, physiological responses or both. Our experimental design restricted our mediation model by the order of events; imagined contact predicted our outcome variables, and a reversed model could not be considered. We hypothesized that the relationship between imagined contact and explicit avoidance would be mediated by explicit attitudes, a relationship found in prior contact research and imagined contact research (Brown & Hewstone, 2005; West et al., 2011).

We focused on anticipatory physiological responses because we expected that more varied behaviors and higher levels of physical activity and physiological arousal during the actual interaction could make meaningful differences between conditions harder to discern. During the anticipation phase, all participants were behaving in exactly the same

way—sitting still in a chair—behavior that minimized other sources of variation in skin conductance and interbeat interval (IBI). Thus, any changes in skin conductance and IBI during the anticipation phase caused (or buffered) by the preceding imagined contact task would be easier to detect. However, once the participants began interacting with the confederate (in the interaction phase) several other potential sources could affect their physiological responses. For example, some participants may have been more talkative while others may have been more inclined to listen; some participants may have been laughing more or less depending on the topic of conversation, and some participants might have had a greater tendency to use physical gestures, regardless of the topic of conversation or their feelings toward their interaction partner. While it is possible that imagined contact could lead to meaningful and relevant differences in physiological responses during the behavioral phase of the experiment, the noise added to the data during this phase of the experiment would make those differences harder to detect.

As mentioned earlier, the relationship between physiological responses and explicit measures is quite complex; as several physiological changes can map onto a given change in mental state (and vice-versa), simplistic predictions of mental state and behavior based on physiological measures are unlikely to be successful (Cacioppo et al., 2000). Nonetheless, prior research has shown that stress caused by intergroup interactions does have physiological correlates (Mendes et al., 2002), and that both prior direct contact (Page-Gould et al., 2010) and prior extended contact (West & Turner, 2014) can buffer these physiological stress responses. Furthermore, physiological responses can be related to implicit associations and nonverbal behaviors (Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997; Egloff & Schmukle, 2002; Egloff, Wilhelm, Neubauer, Mauss, & Gross, 2002; McConnell & Leibold, 2001), which have also been shown to affect the quality of cross-group interactions (Dovidio et al., 2006; West & Turner, 2014). Thus, it seems reasonable to predict, in this research, that participants' anticipatory physiological responses to an intergroup interaction should be buffered by imagined contact, and that this buffering of physiological responses should mediate the relationship between imagined contact and the quality of the subsequent interaction.

## Method

### Participants

Forty-nine students (45 female, *mean age* = 21.41) were randomly assigned to an imagined contact or control condition. The imagined contact condition contained more females (Fisher's exact test,  $p = .028$ ), but gender was not related to

any outcome variables ( $.18 < p < .74$ ).<sup>1</sup> There were no differences in age between the two conditions,  $t(47) = .73$ ,  $p = .47$ . Participants received course credit and none indicated any history of psychosis-related mental health disorders.

### Materials and procedure

West et al. (2011) explored multiple imagined contact and control conditions to identify those that were most effective and removed the most possible confounds. The main advantages of the procedure which we adopted (described below as used by West et al., 2011, Expt 4; and also by West & Bruckmüller, 2013, Expt 1) are that (1) the specific and explicitly positive scenario ensures a positive imagined interaction, (2) the use of real exemplars increases believability, and (3) all participants first receive exactly the same information before being asked to do an imagined contact or control task. As such, this procedure eliminates the possible confound of imagined contact and positive information, permitting the clear examination of the effects of the imagined contact task.

Hence, we copied their procedure exactly. All participants first received information about two real individuals—Tom Harrell and Arturo Sandoval—successful jazz trumpeters, similar to each other, one of whom (Tom Harrell) has schizophrenia. Participants in the imagined contact condition then spent 2 min imagining having a positive conversation with Tom Harrell at a train station. Control participants received identical information and instructions, except that they imagined interacting with Arturo Sandoval (see West et al., 2011 for the full instruction set and explanations of the chosen target-group members). Participants then reported their

<sup>1</sup>We note the very uneven distribution of males in the participant sample and that all males were in the control condition. This was an unfortunate consequence of random assignment and a very small number of male participants. However, we also note that, when males were removed from the sample, this had no effect on the direction or significance of the explicit measures. We still found the expected multivariate effect of imagined contact on our explicit outcome variables  $F(3, 41) = 3.21$ ,  $p = .033$ ,  $\eta_p^2 = .19$ . Participants in the imagined contact condition still reported more positive attitudes,  $F(1, 43) = 4.88$ ,  $p = .033$ ,  $\eta_p^2 = .10$ , and less avoidance,  $F(1, 43) = 7.81$ ,  $p = .008$ ,  $\eta_p^2 = .11$ . Also, our confederate still reported more positive interactions with participants in the imagined contact condition than those in the control condition,  $F(1, 43) = 4.19$ ,  $p = .047$ ,  $\eta_p^2 = .089$  (or using nonparametric tests;  $\chi^2(1) = 4.03$ ,  $p = .045$ ; Mann-Whitney  $U = 291$ ,  $p = .048$ ). The differences between conditions in our physiological measures, although just shy of significance at the 5% level ( $.065 < p < .084$ ), are both still in the same direction. Furthermore, this appears to be a result of reduced power, as male participants are typical of their condition. Specifically the males' mean IBI score (.116) was very close to the mean for that condition (.103) and well within one standard deviation of the mean ( $.015 < \text{Mean ISD} < .191$ ). Similarly the males' mean SCR score (9.75) was very close to the mean for that condition (9.52) and well within one standard deviation of the mean ( $15.24 < \text{Mean ISD} < 3.80$ ).

attitudes toward, and desired avoidance of, people with schizophrenia.

### Explicit attitude and avoidance measures

We assessed attitudes using four items ( $\alpha = .80$ ) on 7-point semantic differential scales indicating participants' feelings toward people with schizophrenia (see West et al., 2011): cold–warm, suspicious–trusting, respectful–contempt (reversed), and admiration–disgust (reversed). We assessed desired avoidance with six items ( $\alpha = .84$ ) used in similar research (Tam, Hewstone, Kenworthy, & Cairns, 2009; West et al., 2011): “I think people with schizophrenia pose a risk to other people unless they are hospitalized,” “If I were a landlord, I probably would rent an apartment to a person with schizophrenia” (reversed), and “I would try to avoid a person with schizophrenia.” Participants also indicated how much they would respond in each of the following ways to people with schizophrenia: “avoid them,” “have nothing to do with them,” “keep them at a distance.” Unless otherwise stated, all items were assessed on a 7-point Likert scale (1 = Not at all, 7 = Very much).

### Physiological measures and subsequent interaction

Following the imagined contact (or control) task, and explicit measures, we monitored participants' physiological responses during the subsequent phases of the experiment: baseline ( $T_1$ ), anticipation ( $T_2$ ), and interaction ( $T_3$ ). Similar to West and Turner (2014), we used nonspecific skin conductance responses (NS-SCR) and cardiovascular IBI as physiological correlates of participants' arousal during the different phases of the experiment (Figure 1).

Physiological responses were monitored using a MP35 system (BIOPAC Systems, Goleta, CA) and analyzed with BIOPAC software AcqKnowledge 3.9.2 for Mac OS X. Electrodes used to measure NS-SCR and IBI were attached to the participants after the attitudes and avoidance questionnaires. NS-SCR was sampled at 200 Hz using electrodermal gel electrodes (BIOPAC model EL507) attached to the distal phalanx of the index and middle fingers of the nondominant hand. A constant voltage (0.5 V) measured skin conductance (cf. Fowles et al., 1981). The NS-SCR was digitized at the electrodes and a 1 Hz filter applied (Gain 2  $\mu\text{mho/V}$ ). NS-SCRs were located using a threshold level of 0.05  $\mu\text{mho}$ . Recording of the IBI was sampled at 200 Hz (range: .05–35 Hz) using three electrodes (BIOPAC EL502, Lead II), one the right wrist and the inside of each ankle. The signal was high-pass filtered at 0.5 Hz to obtain a stable baseline with level peaks and no drift. Peaks were detected automatically using a threshold level fixed at zero, to give measures of R–R intervals between beats (interbeat interval, IBI), which is the time between con-

secutive heart beats from the beginning of one QRS complex to the beginning of the next. The automatic detection of the NS-SCR and QRS complexes by the software were verified visually and corrected in case of misdetection.

Participants were first given 5 min to relax, after which we monitored their physiological responses for 2 further minutes of inactivity ( $T_1$ , baseline phase). All participants then received the instruction: “In two minutes a person with schizophrenia will knock on this door, come in, sit in this chair and have a brief conversation with you that will last about 2 minutes. Try to have a normal conversation.” Participants were then left alone for 2 min ( $T_2$ , anticipation phase), after which the confederate knocked, sat in a chair 90 cm from and facing the participant, and engaged the participant in a 2-min conversation ( $T_3$ , interaction phase: see Figure 1, for experimental timeline and prototypical examples of the NS-SCR and IBI data).

The confederate was a White male in his early twenties, unaware of the nature of the experiment, experimental conditions and hypotheses. For practical reasons, we did not use a confederate who actually had schizophrenia, but rather an actor who could play the role. He was instructed to avoid a stereotypical or negative representation and given prior research on interactions with nonstereotypical people with schizophrenia (West et al., 2011). The confederate was aware that the participants thought he had schizophrenia. However, as this applied to both conditions it could not have affected our results in a systematic way between conditions. During debriefing all participants reported being convinced that the confederate did in fact have schizophrenia. After the 2-min conversation the confederate rated the positivity of the interaction on a 7-point scale (1 = Very Negative, 7 = Very Positive).

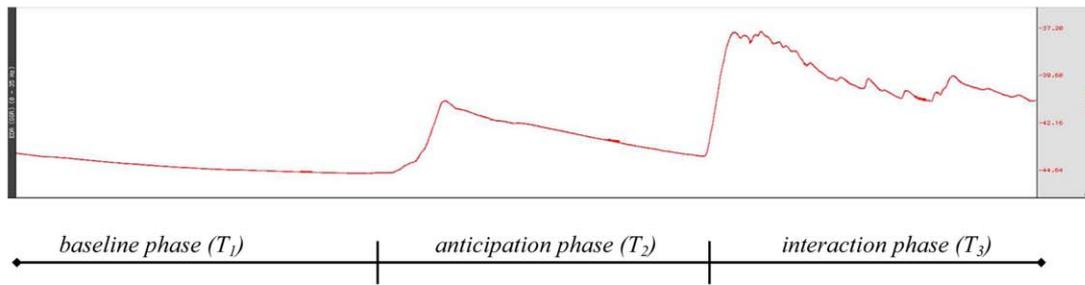
## Results

### Differences between conditions

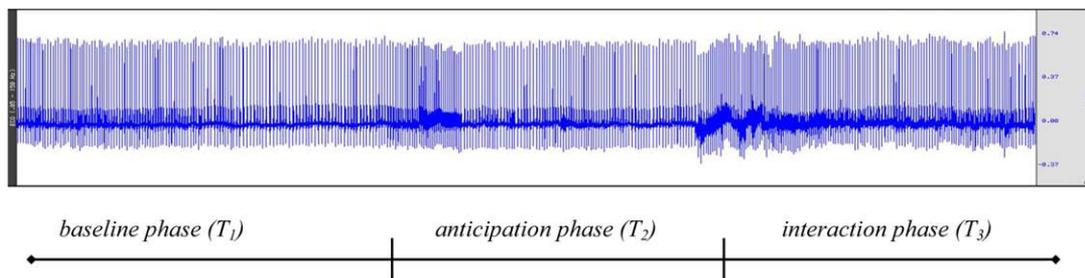
We coded the imagined contact condition as 1 and the control condition as  $-1$ . Correlations between all variables are shown in Table 1. Using multivariate analysis of variance, we found the expected multivariate effect of imagined contact on our normally distributed explicit outcome variables  $F(2, 46) = 4.27, p = .02, \eta_p^2 = .16$ . Participants in the imagined contact condition reported more positive attitudes,  $M = 4.77, SD = .84$  versus  $M = 4.19, SD = .61, F(1, 47) = 7.03, p = .011, \eta_p^2 = .13$ , and less desired avoidance,  $M = 2.38, SD = .77$  versus  $M = 3.08, SD = 1.12, F(1, 47) = 5.79, p = .02, \eta_p^2 = .11$  (see Figure 2a).

The confederate's ratings of the positivity of the interaction were not normally distributed and extremely high across both conditions ( $M = 6.84, SD = .37$  on a 7-point scale). Indeed, the confederate only used the “6” and the “7” of the

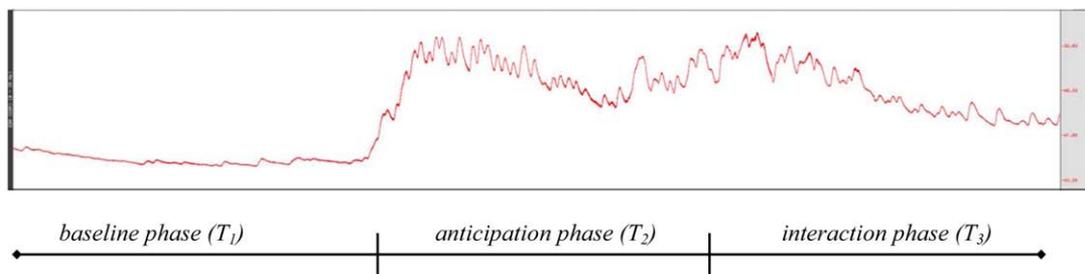
*a. Imagined contact Participant (36004) – Skin conductance response*



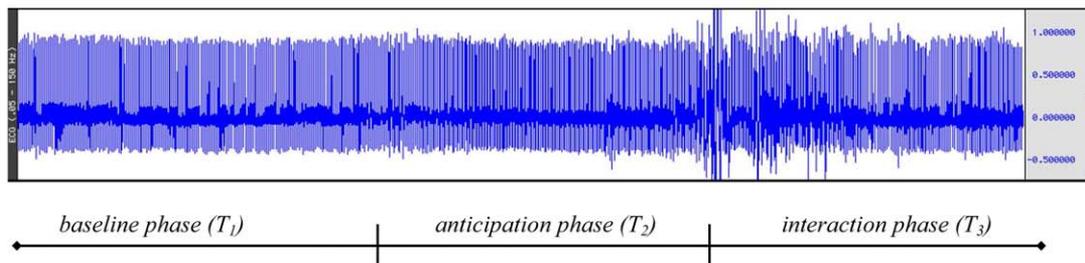
*Imagined contact Participant (36004) – Electrocardiograph*



*b. Control Participant (37802) – Skin conductance response*



*Control Participant (37802) – Electrocardiograph*



**Figure 1** Prototypical examples of the skin conductance responses and ECG recording during the three phases of the study, baseline ( $T_1$ ), anticipation ( $T_2$ ), and interaction phases ( $T_3$ ) from one imagined contact (a) and one control participant (b). Note the greater increase in NS-SCR and IBI in the control participant during the anticipation phase. [Color figure can be viewed in the online issue, which is available at [wileyonlinelibrary.com](http://wileyonlinelibrary.com).]

**Table 1** Correlations Between All Variables

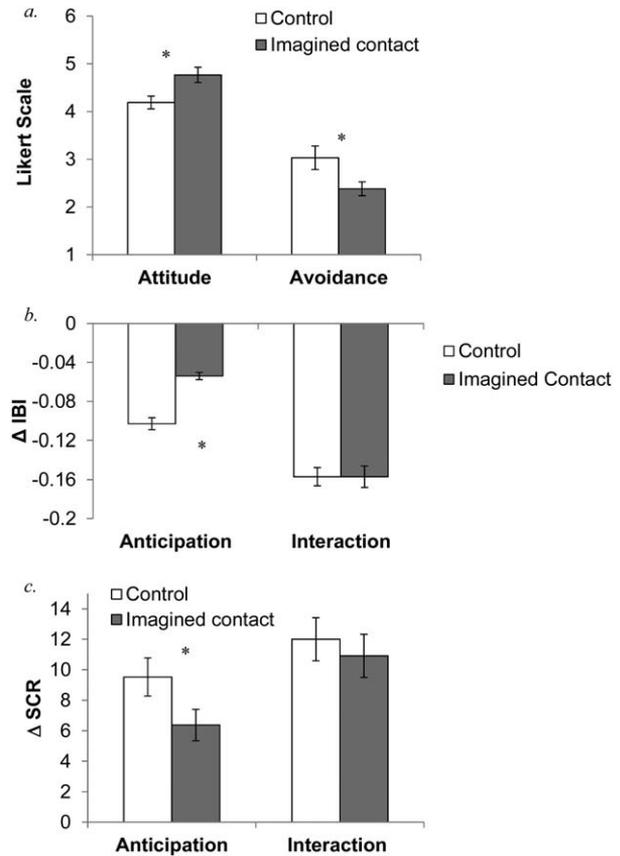
	(1)	(2)	(3)	(4)	(5)	(6)
1. Imagined contact	1					
2. Attitudes	.36*	1				
3. Avoidance	-.33*	-.54***	1			
4. Interaction Quality	.29*	.19	-.47**	1		
5. $\Delta$ IBI (T2: anticipation)	.32*	-.11	.11	.02	1	
6. $\Delta$ NS-SCR (T2: anticipation)	-.29 <sup>†</sup>	.12	-.30*	.03	-.36*	1

Note: <sup>†</sup> = .056, \* $p$  < .05, \*\* $p$  < .01, \*\*\* $p$  < .001.

7-point scale. We thus analyzed these nonnormally distributed ratings of interaction quality using a nonparametric test (Mann-Whitney). As expected, our confederate reported more positive interactions with participants in the imagined contact condition ( $M = 6.93$ ) than with participants in the control condition ( $M = 6.71$ ),  $U = 357.0$ ,  $Z = 1.99$ ,  $p = .047$ . We found similar results using a  $\chi^2$  test in which the positivity scores were treated as binary categories (i.e., 6 = less positive, 7 = more positive),  $\chi^2(1) = 4.03$ ,  $p = .045$ .

To reduce noise caused by individual variation in physiological reactivity, we investigated the effect of imagined contact on change in physiological responses rather than simply the effect of imagined contact on the responses during the different phases. We computed IBI difference scores for the anticipation and interaction phases, by subtracting the mean IBI (in seconds) for the baseline phase ( $T_1$ ) from that of the anticipation ( $T_2$ ) and interaction ( $T_3$ ) phases such that larger (negative) difference scores reflected a larger decrease in IBI and more stress. We computed NS-SCR difference scores by subtracting the number of NS-SCRs in the baseline phase ( $T_1$ ) from that of the subsequent phases ( $T_2$ – $T_3$ ), so that higher (positive) difference scores indicated a larger increase in the number of NS-SCRs and more stress. In sum, for  $\Delta$ IBI larger negative numbers indicated more stress, while for  $\Delta$ NS-SCR larger positive numbers indicated more stress.

These non-normally distributed physiological data (Shapiro–Wilk) were analyzed using planned nonparametric tests (Mann–Whitney). As expected, no differences were found between conditions in baseline ( $T_1$ ) IBI scores ( $U = 289.0$ ,  $Z = .58$ ,  $p = .56$ ) or NS-SCRs ( $U = 233.0$ ,  $Z = -.44$ ,  $p = .66$ ). However, in the anticipation phase ( $T_2$ ), participants in the imagined contact condition experienced a smaller change in IBI scores ( $M = -.054$ ,  $SD = .061$ ) than did participants in the control condition ( $M = -.103$ ,  $SD = .088$ ;  $U = 352.0$ ,  $Z = 1.99$ ,  $p = .047$ ,  $d = .64$ , see Figure 2b). Similarly, in the anticipation phase ( $T_2$ ), participants in the imagined contact condition experienced a smaller increase in the number of NS-SCRs ( $M = 6.37$ ,  $SD = 5.03$ ) than did participants in the control condition, ( $M = 9.52$ ,  $SD = 5.71$ ;  $U = 164.5$ ,  $Z = -1.996$ ,  $p = .046$ ,  $d = .58$ , see Figure 2c). Given the many varied sources of physiological arousal during social interactions, we did not expect to find

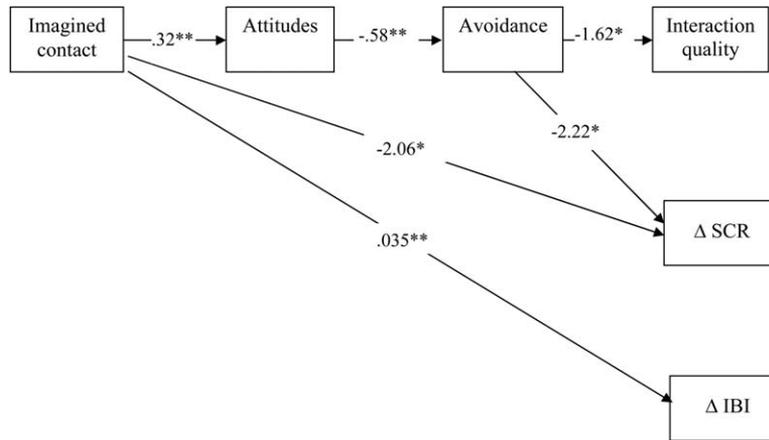


**Figure 2** (a) Participants who imagined talking to a person with schizophrenia reported more positive attitudes and less avoidance toward people with schizophrenia. During the anticipation phase participants in the imagined contact condition experienced a smaller change in interbeat interval (b) and a smaller increase in the number of NS-SCRs (c), both indicative of less anticipatory anxiety. Bar graphs represent mean difference scores and standard error of the mean.

significant differences between the conditions for either  $\Delta$ IBI or  $\Delta$ NS-SCR in the interaction phase ( $T_3$ ). As expected, in this phase ( $T_3$ ) there was no significant difference in either  $\Delta$ IBI scores ( $M = -.157$ ,  $SD = .14$  vs.  $M = -.157$ ,  $SD = .09$ ;  $U = 285.0$ ,  $Z = -.50$ ,  $p = .62$ ,  $d < .001$ ) or  $\Delta$ NS-SCR ( $M = 10.92$ ,  $SD = 6.93$  vs.  $M = 12.0$ ,  $SD = 6.47$ ;  $U = 229.5$ ,  $Z = -.51$ ,  $p = .61$ ,  $d = .16$ ) between participants in the imagined contact condition and the control condition.

## Mediation analyses

Our experimental design constrained our mediation model to the order of events (i.e., variables in the model could only predict other variables that happened after them, and only be predicted by variables that happened before them). We tested the relationship between imagined contact, attitudes, avoidance,  $\Delta$ IBI,  $\Delta$ NS-SCR, and interaction quality using Preacher–Hayes bootstrap tests (Hayes, 2009, model 6). This



**Figure 3** A mediation model showing the relationship between imagined contact and the confederate's perception of the interaction, mediated by attitudes and desired avoidance, and direct effects of imagined contact on  $\Delta$ NS-SCR and  $\Delta$ IBI.

method of analysis, currently favored over other tests of mediation (Fritz & Mackinnon, 2007), allowed us to simultaneously investigate all direct and indirect relationships between our variables. We found that imagined contact predicted more favorable attitudes ( $b = .32$ ,  $p = .009$ ), which predicted reduced avoidance ( $b = -.58$ ,  $p = .001$ ), which predicted higher quality of the interaction ( $b = -1.62$ ,  $p = .018$ ). Imagined contact also directly predicted smaller  $\Delta$ IBI ( $b = .035$ ,  $p = .006$ ), and smaller  $\Delta$ NS-SCR ( $b = -2.06$ ,  $p = .024$ ). We also found that imagined contact indirectly predicted higher interaction quality via improved attitudes and reduced explicit avoidance ( $.002 < b < 1.20$ , with a point estimate of .30); see Figure 3.

We also found an unexpected relationship between imagined contact, explicit avoidance and  $\Delta$ NS-SCR. While imagined contact (indirectly) predicted less explicit avoidance and (directly) predicted smaller  $\Delta$ NS-SCR ( $b = -2.06$ ,  $p = .024$ ), explicit avoidance also (directly) predicted smaller  $\Delta$ NS-SCR ( $b = -2.22$ ,  $p = .017$ ). Although this pattern is unusual, it is not impossible; while the overall effect of imagined contact may have been to decrease both explicit avoidance and  $\Delta$ NS-SCR between conditions, it is nonetheless possible that the relationship between explicit avoidance and  $\Delta$ NS-SCR be negative within conditions. As this relationship was not related to our hypotheses, we did not consider it further at this time. No further model testing was necessary as all paths had already been investigated and the model was restricted by the order in which events occurred.

## Discussion

Imagined contact has been shown to improve explicit responses to people with schizophrenia (West & Bruckmüller, 2013; West et al., 2011), and intended behaviors toward multiple other groups (see e.g., Turner et al., 2013). This is

the first study, however, to show that imagined contact can also improve anticipatory physiological responses to outgroup members and the quality of an actual subsequent interaction in a manner detectable by a confederate posing as target-group member. Using a social psychophysiological approach, we found that those participants who imagined a pleasant interaction with someone with schizophrenia subsequently reported more positive attitudes, exhibited smaller increases in cardiovascular and electrodermal activity, and subsequently had a more positive encounter than did participants in the control condition. Below we discuss these findings in terms of their implications, potential limitations, and suggested avenues for future research.

## Implications

Contact-based research has been criticized for a focus on changing attitudes, rather than improving actual intergroup interactions, and for a focus on the responses of majority members while largely ignoring the experiences and concerns of targeted minority-group members (Devine et al., 1996; Dixon et al., 2010). Thus, although prior research has shown that imagined contact affects majority-group members' cognitive and affective responses to this target group (West & Bruckmüller, 2013; West et al., 2011), this research has taken the important step of moving beyond majority-members' responses, showing that imagined contact can improve the experience of subsequent interactions for a (confederate posing as a) target-group member. This suggests that the effects of imagined contact extend beyond the participant doing the imagined contact task and include changes to actual intergroup interactions.

This research is also the first to show that imagined contact can affect anticipatory physiological responses to interactions with outgroup members. This is important as prior

research points to a relationship between physiological responses and the quality of intergroup interactions (Dovidio et al., 2006). Indeed, physiological responses are more closely related to nonverbal behaviors that set the tone of the interaction (Dovidio et al., 2006, 2002). Furthermore, a concern sometimes raised with imagined contact is that significant results may simply reflect demand characteristics. This issue has been dealt with in previous imagined contact research (see Crisp & Turner, 2012), particularly experiments showing that imagined contact alters implicit as well as explicit bias (see Turner & Crisp, 2010; Turner & West, 2012). This research, which investigates physiological responses outside of participants' control, is an addition to that body of research refuting the criticism of demand characteristics.

### Limitations

Although this is the first study to demonstrate that imagined contact can improve the quality of a subsequent interaction, an important limitation of this study is that we did not show how this improvement was accomplished nor did we demonstrate the importance of investigating physiological measures. Prior research shows that physiological responses predict nonverbal behaviors (e.g., Dovidio et al., 2006; Littleford, Wright, & Sayoc-Parial, 2005) and that nonverbal behaviors predict interaction quality (e.g., West & Turner, 2014). However, this current research did not include measures of nonverbal behaviors nor did we find any direct relationship between anticipatory physiological responses and subsequent interaction quality.

There are number of possible explanations for this lack of relationship. The most apparent is the nature of our measures of interaction quality: a single-item measure of positivity that only considered the perspective of the confederate. More in-depth, multi-item measures might have pointed to specific aspects of the interaction that were affected by the imagined contact task and the participants' physiological responses. Furthermore, at no point did participants rate the quality of the interaction nor were the interactions recorded, which would have permitted independent raters to judge the quality of the interactions. We also did not ask the confederate why he found some interactions more positive than others nor did we observe the participants' nonverbal behaviors, which may have mediated the relationship between physiological responses and interaction quality. Finally, the confederate reported finding all the interactions positive or very positive (perhaps out of concern for being polite), significantly reducing the variance, and thus the sensitivity, of our measure. Future research that aims to clarify how imagined contact improves actual subsequent interaction would benefit from measures of both participant and target nonverbal behaviors (e.g., with a hidden camera, or two-way

mirror), as well as multi-item measures of the quality of the interaction from both perspectives.

We found that even a procedure with a very brief social interaction (2 min) is sufficient to gather meaningful information on the effect of imagined contact on behavior. It speaks to the strengths of imagined contact that it produced differences in the participants' interaction styles that were detectable by a naïve confederate even after such a short period of time, as well as significant changes in anticipatory physiological stress responses. However, a possible criticism of this methodology is that the effects of imagined contact may be restricted to a very brief interaction that takes place shortly after the imagined contact task. This echoes other criticisms of the strength and durability of imagined contacts' effects (although for a response to those criticisms, see Husnu & Crisp, 2010a). Similarly, although imagined contact improved attitudes, reduced avoidance and improved interaction quality, all these measures generally fell on the positive side of the scales, regardless of condition. Thus, in this experiment, the effects of imagined contact were generally to make relatively positive responses even more positive. An important question for future research is whether this approach can also affect stronger prejudices, long-term behavior, and the quality of deeper, more meaningful interactions with outgroups members.

We also note that we assessed the experience of a confederate who did not in fact have schizophrenia and instead of the experience of a person who did in fact have schizophrenia. At debriefing, we found that all participants believed that they were interacting with someone who was suffering from this disorder. Some even reinterpreted facts from his life (e.g., "He said he took a year out") to fit with the narrative of assumed mental illness (e.g., "I wondered if that was because of his schizophrenia"). Nonetheless, although this confederate did find the interactions slightly more pleasant if the participants had previously completed an imagined contact task, we do not know whether a person who really had schizophrenia would have experienced or interpreted the interactions in the same way.

There is evidence that majority and minority group members behave differently in social interactions (Frale, Blackstone, & Scherbaum, 1990; Miller, Rothblum, Felicio, & Brand, 1995). However, for some time, social psychologists have been able to show that minority and majority group members interpret others' responses, particularly nonverbal responses, in similar ways. For example, Word et al. (1974: Expt 2) subjected naïve White interviewees to the same nonverbal treatment that was typically shown to Black interviewees (as assessed in Expt 1). They found that the White interviewees who received this treatment reacted in similar ways to the Black interviewees; they appeared more nervous, experienced the interviews as more negative and performed

less adequately during the interview. This suggests that our findings provide a useful indication of how a person with schizophrenia might interpret these interactions. Nonetheless, future research with genuine outgroup members should offer important insights into the effects of imagined contact on real intergroup interactions.

## Conclusions

One of the most important impacts of imagined contact is that it might help prepare people for direct contact by changing how they behave toward members of other groups (e.g., Crisp & Turner, 2012). This research is the first to provide evidence that this goal could be realized. We showed that imagined contact not only led to more

positive explicit outgroup attitudes but also reduced anticipatory physiological anxiety and improved the quality of subsequent intergroup interactions in a manner detectable by an interaction partner. These findings suggest that imagined contact's effects are not limited to changing the participant involved, but may also have the power to improve intergroup interactions for outgroup members who may meet the participant later. It has been previously argued that a strength of imagined contact is its capacity to encourage people to seek out contact, remove inhibitions associated with existing prejudices, and prepare people to engage with outgroup members. These findings provide support for this argument and also support the use of imagined contact as an intervention to improve the treatment of people with severe mental health disorders.

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