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Corresponding Author: Dr Lucy Johnston, PhD

Corresponding Author's Institution: University of Canterbury

First Author: Yanelia Yabar, PhD

Order of Authors: Yanelia Yabar, PhD; Lucy Johnston, PhD; Lynden Miles, PhD; Victoria Peace, BA

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*** Response to Reviewer Comments**

Dear Professor Friedman

Many thanks for your comments and the reviews of our manuscript (#JONB39), "Implicit Behavioral Mimicry: Investigating the Impact of Group Membership". We have revised the manuscript in light of the very helpful comments made by yourself and the reviewers, as detailed below. Our emphasis in revising the manuscript was to try to clarify the findings of Experiment 2 and their possible explanation. In doing so we have conducted some additional analyses and elaborated on possible explanations for the reported effects. In addition we have attended to each of the other points raised by yourself and each of the reviewers. We hope that this revised manuscript is considered satisfactory for publication in JNVB and look forward to hearing back from you.

Responses to the Editor's Comments:

- Full details of the analysis of the number of face touches measure is now provided in Footnote 2.
- A Table has been included in the manuscript containing means, SDs and inter-quartile ranges for the mimicry scores for both experiments.
- A Figure displaying the results from experiment 2 is also included in the revision.
- Fuller details with regard to the nature of the target group in our experiments and the rationale for selecting a distinctive disliked group is provided on pages 5 and 6 of the revised manuscript.
- The comment, "except that, as there was no effect of video-tape version …" has been clarified (page 16).
- The order of data collection has been clarified in the procedure section in Experiment 2 (page 18) and is also considered in the general discussion section.
- We have not discussed the recent criticisms of the IAT as a measure of implicit attitudes in the revised document as we felt that this issue was somewhat tangential to the main thrust of the paper. However, we have discussed the relative versus absolute nature of our attitudinal measures in the General Discussion section as this has implications for the interpretation of our findings.

Responses to Reviewer 1's comments:

- Additional analyses are included for Experiment 2 (pages 18-20) and greater discussion of the possible explanations for the differences between the implicit and explicit measures and their relationship to mimicry is provided in the General Discussion section.
- The divergence between our position and that of previous authors (e.g., Chartrand & Bargh) regarding the automaticity, or inevitability, of mimicry is elaborated upon in the revised introduction section (page 4).
- A summary of the manipulations and their rationale has been provided at the beginning of the materials section in the methodology for Experiment 1 (page 8).
- Consistency with regard to the number of participants and their exclusion as a result of responses to the funnel debriefing has been ensured for both experiments.

Responses to Reviewer 2's comments:

- As detailed above, the rationale for the selection of an out-group confederate has been elaborated upon in the introduction section (pages 5-6). In addition, greater consideration of the relationship between the participant's group membership and that of the targets and how this might impact on mimicry is considered, especially in Experiment 2 (page 18). In considering this relationship we have also been more circumspect in our use of the term "in-group" through the manuscript.

- Greater consideration is given to the relationship between the implicit and explicit liking scores and how this impacts upon mimicry in Experiment 2 (page 20) and this is elaborated upon in the General Discussion section.

Responses to Reviewer 3's comments

- We, of course, very much liked these comments!

Implicit Behavioral Mimicry: Investigating the Impact of Group Membership

Yanelia Yabar[1]
Lucy Johnston[1]
Lynden Miles[1]
Victoria Peace[2]

[1]University of Canterbury
[2]University of Bath

Address for correspondence:
Associate Professor Lucy Johnston
Department of Psychology
University of Canterbury
Private Bag 4800
Christchurch 8020
New Zealand

fax: +64 3 364218
e-mail: lucy.johnston@canterbury.ac.nz

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Abstract

Two experiments investigated the impact of group membership on non-conscious behavioral mimicry. Female participants viewed videotapes of female confederates who rubbed their faces whilst describing a picture. The extent to which the participant mimicked this face rubbing behavior was assessed from video footage taken using a hidden video-camera. Experiment 1 showed greater mimicry of a member of an in-group than of a member of an out-group. Experiment 2 showed both explicit and implicit liking of a target group to predict the extent of mimicry of a member of that group. There was a positive relationship between implicit liking and mimicry but a negative relationship between explicit liking and mimicry. Results are discussed in terms of processes underlying mimicry.

Behavioral mimicry, the taking on of the postures, gestures and mannerisms of interaction partners, can occur without deliberate intention or conscious awareness.[1] Individuals have been shown to mimic, without awareness, the postures (Berger & Hadley, 1975; Bernieri & Rosenthal, 1991), gestures (Bavelas, Black, Chovil, Lemery, & Mullett, 1988; Bavelas, Black, Lemery, & Mullett, 1987; Chartrand & Bargh, 1999), facial expressions (Blairy, Herrera, & Hess, 1999; Dimberg, 1988; Dimberg, Thumberg, & Elmehed, 2000; Hatfield, Cacioppo, & Rapson, 1994; Meltzoff & Moore, 1977; Vaughan & Lanzetta, 1981), and speech patterns and accents (Cappella & Panalp, 1981; Giles & Powesland, 1975; Giles & Smith, 1979; Webb, 1969, 1972) of their interaction partners (for a review see Chartrand, Cheng, & Jefferis, 2002).

Such mimicry is a positive component of social interactions, increasing liking for, and rapport with, interaction partners and enhancing the smoothness of interactions (Bernieri, 1988; Bernieri, Davis, Rosenthal, & Knee, 1994; Chartrand & Bargh, 1999; LaFrance & Ickes, 1981; Lakin & Chartrand, 2003). Individuals mimic more those whom they like, and like more those who mimic them (Chartrand & Bargh, 1999; Stel, Blascovich, McCall, & Vonk, 2005; for a review see Chartrand & Jeffries, 2003). Similarly, observers perceive those individuals who display postural mimicry during an interaction to be friends but those who do not show mimicry to be strangers (Bavelas et al., 1987, 1988). Being mimicked in an interaction also influences an individual's subsequent behavior. Individuals were more likely to help somebody pick up dropped items if they had been mimicked in a previous encounter, regardless of whether the person who had dropped the items was their previous interaction partner or a stranger (van Baaren, Holland, Kawakami, & van Knippenberg, 2003). Waitresses received higher tips from customers whom they mimicked whilst taking their order than from customers whom they did not mimic (van Baaren, Holland, Steenaert, & van Knippenberg, 2003).

It has been argued that mimicry is a means of achieving social connectedness (Condon & Sander, 1974; Kendon, 1970; Lakin, Jefferis, Cheng, & Chartrand, 2003; Van Baaren, et al., 2003), a mechanism by which social goals can be fulfilled (for a review see Chartrand, Maddux, & Lakin, 2005). Our ancestors lived in an environment in which social isolates did not survive and reproduce (Buss & Kendrick, 1998; Johnson & Edgar, 1996). Through mechanisms such as mimicry, liking could be enhanced which would, in turn, have increased the opportunities for food sharing, for mating, and for predator avoidance, leading to selection and retention of the tendency to mimic in social encounters (Cosmides & Tooby, 1992; Lakin et al., 2003). A failure to facilitate positive social interactions, using mechanisms such as mimicry, may have led to social isolation and hence evolutionary disadvantage (Caporael, 1997, 2001; Lewin, 1943; Poirier & McKee, 1999).

Behavioral mimicry may be adaptive, and can occur spontaneously, without conscious awareness. However, mimicry is not inevitable; seeing another person perform a given action does not compel one to perform the same action oneself. Contrary to the suggestion that mimicry is an automatic process (Chartrand & Bargh, 1999), a number of factors have been shown to moderate the extent to which a given interaction partner is mimicked in social encounters, including characteristics of the perceiver, the situation and the relationship between perceiver and target. Goals or intentions incompatible with the to-be-mimicked behavior leads to reduced, or no, mimicry of the target behavior (Johnston, 2002). High and low self-monitors differed in the extent of mimicry of confederates (Cheng & Chartrand, 2003) and greater mimicry was associated with context-dependent than with context-independent information processing (van Baaren, Horgan, Chartrand, Dijksterhuis, & Horgan, 2004).

Most relevant to the present research is the impact on mimicry of the relationship between interactants. Given the role of mimicry in affiliation, interaction smoothness and

rapport, the extent to which mimicry is manifest in an interaction may also be influenced by who one is interacting with (Lott & Lott, 1961). Especially important may be the extent to which one is, or wishes to be, affiliated with one's interaction partner. Lakin and Chartrand (2003) demonstrated the impact of affiliation goals on mimicry in interactions with strangers. Those participants given an affiliation goal, either through explicit instructions or through subliminal priming, mimicked an interaction partner to a greater extent than did participants given no such affiliation goal, indicating that mimicry is indeed used as a means of increasing affiliation within social interactions. Similarly, individuals who had recently been excluded from a social group mimicked the behaviors of a confederate more than did those individuals who had been included in the group, suggesting that excluded individuals may use mimicry as an attempt to affiliate with someone and create liking and rapport (Lakin & Chartrand, 2003).

Although it is argued that humans have a fundamental need to affiliate and to belong (Baumeister & Leary, 1995; Brewer, 1991), the strength of this need varies across interaction partners. The strength of an affiliation goal, or need, should influence the extent of behavioral mimicry (Lakin & Chartrand, 2003). There are some people, for example in-group members and important others, with whom we have a stronger affiliation goal than with others (Cheng & Chartrand, 2003; Gump & Kulik, 1997). Previous work has demonstrated that individuals do show greater mimicry of a target when given an affiliation goal than when they have no such goal (Lakin & Chartrand, 2003). Whether individuals show reduced mimicry of disliked individuals has not, however, been considered in the past literature. For some people, an individual's affiliation goal may be very weak. Associating with stigmatized individuals, disliked others, or out-group members, can lead to a negative stigma-by-association and ostracism from the in-group (Neuberg, Smith, Hoffman, & Russell, 1994). Accordingly, individuals who do not wish to be ostracized or contaminated

by stigma-by-association may show reduced, or no, mimicry of a stigmatized interaction partner. Given the link between mimicry and rapport, however, it is important to consider such interactions. The present research accordingly considers mimicry of a member of a distinctive and relatively disliked target group.

In the present research we investigated whether mimicry of an out-group member would be inhibited relative to that of an in-group member. Previous research has considered the impact of the nature of the inter-personal relationship between interactants, whilst the present research investigated the impact of the inter-group relationship between interactants. The term "in-group" may not be strictly appropriate here since the group referred to, that of "non-Christians" (see below for description of the target groups), is defined by non-membership of another group (i.e., Christians) and does not have any specific defining, or distinctive features. Whilst members of the group "Christians" are likely to derive a sense of identity from membership in such a distinctive group[2], it is highly unlikely that individuals gain any sense of social identity from being a "non-Christian", although specific sub-groups may do so (e.g., atheists). Accordingly, in the context of this research, it might be better to consider the non-Christian confederate as a neutral confederate without specific group membership. In our experiments participants interacted with an out-group confederate and a neutral confederate. The goal of affiliation is likely to be weaker when interacting with an out-group member (Cheng & Chartrand, 2003; Gump & Kulik, 1997). Accordingly, we predicted that individuals would mimic a member of an out-group less than they would mimic a neutral target (Johnston, 2002).

Experiment 1

In Experiment 1, female participants viewed videotapes of two female targets, one of whom was a member of an out-group. Each of these targets described a picture to the participant

who was led to believe that they would later answer questions about the description. During the description period each target touched/rubbed their face and the degree of mimicry of each target exhibited by the participant was calculated as an index of degree of face touching by the participant relative to a baseline period. Importantly, and in contrast to previous research, our baseline period was one in which the interaction (to-be-mimicked) partner was present but was not displaying to to-be-mimicked behavior. For a 1-minute period prior to the picture description, the target was visible on the computer monitor but appeared to be studying the picture she was to describe and during this period did not touch her face. We argue that this provides a more meaningful baseline of the target behavior (face touching) within a social situation than does a baseline measure when the participant is alone. Mimicry is said to have occurred if the amount of face touching increases in the experimental period relative to the baseline period. The nature of our baseline allows us to eliminate a potential nuisance explanation for an increase in the target behavior (face-touching) during the interaction period. It is possible that individuals simply touch their faces more in the presence of other people than when alone. As the target is visible during our baseline period this explanation can be tested.

Method

Participants. Thirty-two female undergraduate students volunteered to participate in return for a $5 voucher that could be redeemed at University stores. None of the participants self-identified as Christian or wore any jewelry or clothing that would so identify them. Data had to be excluded from 3 participants due to equipment failures, and from 3 participants who reported having been aware of the hidden video camera. This left 26 participants in a single-factor (confederate: Christian/non-Christian) within-subjects design.

Materials. In this experiment each participant was to see a video-tape of two experimental confederates, each describing a nature scene from a target photograph. One of the confederates was to be from a target out-group. Accordingly, in developing the materials for this experiment we first had to identify an appropriate target out-group and a means of ensuring that group membership was readily visible to perceivers. Two scripts were developed for the confederates and each was video-taped reading each script. These video-clips were then embedded into power point displays which also provided experimental instructions to participants. A number of power point displays were created to ensure adequate counter-balancing of both confederate and script order. Each stage of the development of the materials is described further below.

A pilot study was conducted to identify a negatively perceived target group, one with which a desire for affiliation would be low (Cheng & Chartrand, 2003; Gump & Kulik, 1997). Twenty-five students completed the pilot study. For each of 14 target groups (New Zealanders of European descent, Maori, English, French, Chinese, Japanese, Taiwanese, Indians, young people, elderly people, individuals with a physical handicap, individuals with a psychological handicap, obese individuals, and Christians), participants indicated on an "Attitude Thermometer" (Abelson, Kinder, Peters, & Fiske, 1982), anchored "very positive" and "very negative", their feelings toward the target group. The "thermometer" was 100 mm in length and scores were simply a measure of the distance from the bottom of the scale ("very negative") to where the participant had marked the scale. A higher score indicated a more positive attitude toward the target group. The most negatively perceived group was that of Christians ($M = 53.04$ vs. 68.38 for the other target groups) and hence this group was selected for use as the target group in the present research. It should be noted, however, that this target group was still rated, on average, above the mid-point on

the affective thermometer, suggesting relative, but not strong absolute dislike of the group, at least as expressed on an explicit measure of attitudes.

The experimental task involved the participant viewing two targets, each describing a photograph about which the participant was led to believe that she would later be asked questions. She was also led to believe that she would have to describe a photograph to the other participants. Two similar black and white photographs were selected – one showing a beach scene and one a mountain scene. Scripts describing each scene were written by the experimenters. Each script included pauses and insertions such as "um" and "err". The scripts also included instructions to the confederates related to face touching and rubbing (i.e., location on the face and type of touching/rubbing). Two female confederates blind to the purpose of the experiment were given the photographs and scripts to study and were shown, as an example, a videotape of a trained research assistant reading each of the scripts. Each confederate was video-taped for 1 minute whilst looking at the photographs and scripts. During this time she neither spoke nor touched her face, although she did look at the camera and smile on 4 occasions. Each confederate was then videotaped whilst reading each of the scripts. During these descriptions, the confederate constantly touched her face, as prescribed in the scripts. The video-taping was repeated with each confederate wearing a large crucifix around her neck and a fluorescent wrist bracelet with the words "Got God" on it. The confederates were each paid $10 for their participation. Each of the description videotapes was edited so that they were a constant length of 4 minutes. In order to ensure that the facial expressions of the confederates did not vary in any systematic manner that might affect mimicry and/or liking and rapport, each of the video-tapes was also coded for the number of smiles shown by the confederate whilst they were describing the picture. No differences were found between confederates or versions.

The videotapes were incorporated into a PowerPoint slide show presentation that was used to present the cover story and instructions to participants. The experimental task was introduced as a study of the ability of individuals to communicate detailed information through mediated interactions, such as in a web conference setting. The presentation was run on a lap-top computer (Compaq Evo, Intel R, 2.00 GHZ). Each participant saw two video-clips, one of each of the two confederates (non-Christian/Christian) and one of each of the descriptions (beach/lake). Eight versions of the PowerPoint presentation were created in order to counter-balance the order of presentation of the confederate, the type of confederate (non-Christian/Christian), and the description.

Procedure. Participants were recruited to participate in a study on "Social interactions and problem solving". Each participant was greeted at the laboratory by a female experimenter and tested individually. The participant was shown into the test room and seated in front of the computer. The experimenter left the participant alone in the room after telling her to follow the instructions on the computer screen. These instructions informed the participant that the experiment was investigating the effectiveness of computer-based communication and that she would be interacting with two other participants via a computer link (i.e., a webcam). The instructions stated that each participant would describe a picture to the other two and that after each description the listeners would be asked to identify the pictures from a series of images presented by the experimenter. The participant was told that she would be the last of the 3 participants to describe a picture. It was suggested to the participant that to assist her she should pay close attention to the person who was describing the picture. It was explained to the participant that she could not be seen or heard by the other participants. Throughout the experiment the participant was videotaped by a hidden camera and this videotape was later coded for evidence of mimicry.

After viewing both video-clips, the participant completed a funnel debriefing questionnaire which asked the participant to indicate what she thought the purpose of the research was and to indicate if there was anything unusual about the experiment or the other participants. Finally, the participant was fully debriefed, asked to provide written consent for the use of the videotape taken during the experiment, and paid.

Results and Discussion

Data from three participants were eliminated after the funnel debriefing as these participants were aware of the presence of a video-camera during their experimental session. No participants noticed anything unusual about the behaviour of the confederates or believed that their own behaviour was influenced by that of the confederates, however. Preliminary analyses revealed no effect of experimental version on any of our dependent measures. Accordingly, this factor is not discussed further.

The percentage of time spent touching the face was calculated for each participant from the video-clips[3]. For each participant this percentage was calculated for each of the two 1-minute periods in which a confederate was visible on the screen but was looking down at the picture to be described, and was silent and not touching her face; and for each of the two 4-minute periods in which a confederate was describing one of the target pictures and was touching her face. These segments are referred to as the baseline and the experimental periods respectively. Two coders blind to experimental predictions coded each video-clip. Inter-rater reliability was high ($r(44)=.78$, $p<.001$); accordingly a mean percentage was calculated across the two coders. For each participant a mimicry score was calculated for each confederate by subtracting the percentage of face touching in the baseline period from that in the experimental period. Higher mimicry scores indicate greater face touching in the

experimental period relative to baseline, or greater mimicry of the confederate's behavior. Details of the face touching means and distributions are shown in Table 1.

- insert table 1 here -

A single factor (confederate: non-Christian/Christian) repeated-measures ANOVA was conducted on the mimicry scores. This revealed a significant effect, $F(1,25) = 5.47$, $p < .03$; Cohen's $d = .49$[4]. The mimicry score was higher for the non-Christian than for the Christian confederate (*Ms* = 5.40 vs. -2.69). As predicted, participants mimicked the face touching behavior of the non-Christian confederate. When the non-Christian confederate displayed face touching behavior (experimental period), the percentage of time spent by participants touching their face increased relative to baseline. Importantly, a comparison of the mimicry score against zero was significant, $t(25) = 2.69$, $p < .01$, indicating that there was indeed a significant increase in the percentage of face touching in the experimental period relative to the baseline period – i.e., mimicry – when there was a non-Christian confederate. For the Christian confederate, there was no such mimicry. There was a reduction, rather than increase, in face touching by participants when the Christian confederate displayed this behavior. A comparison of the mimicry scores against zero showed, however, that this reduction in the percentage of face touching in the experimental versus the baseline period was not significant, $t(25) = -1.08$, $p = .29$.

These comparisons of the mimicry scores against zero do, however, mask some asymmetry. It is possible to increase one's mimicry in the experimental period relative to the baseline period (i.e., a positive mimicry score) regardless of whether or not one touched one's face in the baseline period. It is, however, only possible to reduce face touching in the experimental period if one touched one's face during the baseline period. Accordingly, for

the mimicry of the Christian confederate we compared the mimicry scores for those participants who had touched their face during the baseline period with the Christian confederate (n=12), and hence for whom a negative mimicry score was possible, and those who had not touched their face during the baseline period (n=14). The former group showed a stronger reduction in mimicry scores than when the whole group was considered, as above. The mean mimicry score was -8.02, which showed a marginally significant difference from zero, t (11) = -1.62, p = .12, offering stronger evidence for reduced mimicry of an out-group target. Those participants who did not touch their face during the baseline period showed a small positive mimicry score (M = 1.87), not significantly different from zero.

As predicted, then, there was an effect of the nature of target on mimicry. There was greater mimicry of the face touching behavior of the non-Christian than the Christian target. When the non-Christian confederate displayed face touching behavior (experimental period), participants touched their face for a greater percentage of time than they did in the baseline period. Comparisons against zero showed that this was a significant increase in the target behavior in the experimental over the baseline period. Given the nature of our baseline recording period, this increase in face touching cannot simply be a consequence of differential behavior when alone and when in the presence of another person. Further, and in contrast to the non-Christian confederate, participants did not mimic the target behaviour of the Christian confederate. Interestingly, there was a mean decrease in the target behaviour by participants, relative to baseline, with the Christian confederate. Lakin and Chartrand (2003) have shown a that having a goal to affiliate with an interaction partner increases mimicry. Our results are consistent, then, with participants having a less strong, or no, goal to affiliate with a member of an out-group (Cheng & Chartrand, 2003; Gump & Kulik, 1997), or indeed with a goal not to affiliate, or to keep one's distance from, members

of an out-group.. Additional investigation regarding the possibility of negative mimicry, the decrease in performance of a target behavior when it is displayed by another person, as a distancing measure or anti-affiliation response, is warranted.

In Experiment 2, we investigated the role of inter-group liking, or affiliation, on mimicry of an out-group target.

Experiment 2

In Experiment 1 we demonstrated that the nature of the to-be-mimicked target influenced the extent to which participants mimicked them. Specifically a member of a distinctive, relatively negatively perceived minority group (Christians), was mimicked less by members of the majority (non-Christian) than was a member of the majority in-group[2]. We reasoned, consistent with previous research, that this difference was due to the relative liking of, and strength of the goal to affiliate with, the neutral and out-group targets. In Experiment 2 we further considered the relationship between the participant's liking of a distinctive minority group and the extent of their mimicry of a member of that group. Experiment 2 was similar to Experiment 1 except that participants were not selected on the basis of being non-Christian. Rather, participants completed both an explicit ("Attitude Thermometer"; Abelson et al., 1982) and an implicit (IAT; Greenwald, McGhee, & Schwarz, 1998) measure of liking of Christians in general and we investigated the extent to which mimicry of a Christian target could be predicted from these liking ratings.

Mimicry has been described as a "social glue" (Lakin et al., 2003), binding people together and creating harmonious relationships. Indeed, previous research has indeed shown a link between mimicry and rapport (Bernieri, 1988; Bernieri et al., 1994; La France, 1979, 1982). Further, it has been suggested that there is a "consistent link between behavioral mimicry and liking" (Lakin et al., 2003, p.147). There is less direct empirical

evidence for a relationship between liking of one's interaction partner and mimicry. Chartrand and Bargh (1999, E2) did show individuals to like confederates who mimicked them more than confederates who did not mimic them and Stel et al. (2005) showed individuals to mimic more a likable than an unlikable confederate. These studies investigating the association between liking and mimicry have considered the impact of liking of the specific interaction partner. In the present experiment, in contrast, we considered the impact of liking of members of a distinctive social group on mimicry of a member of that group. We predicted that if mimicry is indeed associated with the establishment and maintenance of social relationships and is an evolutionary "social glue" (Lakin et al., 2003), then it should be influenced by inter-group as well as inter-personal relationships. In Experiment 1 we showed that individuals mimic less (indeed may counter-mimic) a member of an out-group. In Experiment 2 we aim to show an association between the strength of liking for a distinctive target group and mimicry of a member of that group.

Furthermore, past research investigating the link between mimicry and liking has used only explicit measures of liking. In the present experiment we included both an explicit and an implicit measure of liking of the target group. Recent research suggests that, although related, implicit and explicit attitudes are at least partially separate (Dasgupta & Greenwald, 2001; Greenwald & Banaji, 1995; Karpinski & Hilton, 2001) and that they may have independent power in explaining behavior (Dasgupta & Greenwald, 2001; Karpinski & Hilton, 2001). It is possible, for example, that social desirability factors might influence explicit, but not implicit, liking ratings (Fazio, Jackson, Dunton, & Williams, 1995; Rudman, Ashmore, & Gary, 2001). Indeed, it is noteworthy, that in our pilot study the ratings of all the target groups was positive (above the mid-point of the rating scale) despite these groups being ones about which negative stereotypes and prejudice have been identified within similar participant groups (Harvie, Marshall-McCaskey, & Johnston,

1998; Johnston, Bristow, & Love, 2000; Johnston, Locke, Giles, & Rattray, 1997). We predicted that explicit liking of the group of which the target individual was a member would be related to mimicry, with greater liking of the target group being associated with greater mimicry of an individual member of that target group. Implicit measures of attitudes and prejudice have been shown to predict ratings of friendliness (Fazio et al., 1995) and comfort (McConnell & Leibold, 2001) in social interactions with out-group members, as well as more specific non-verbal behaviors that may also be linked to rapport and comfort in interactions, such as eye contact, physical distance (Dovidio, Kawakami, Johnson, Johnson, & Howard, 1997), smiling, speaking time, speech errors, and speech hesitation (McConnell, & Leibold, 2001). We also predicted, therefore, that implicit liking would be positively related to levels of behavioral mimicry. Given the possibility of social desirability influences on the explicit measures we further predicted that the relationship between implicit liking and mimicry would be stronger than that between explicit liking and mimicry.

Method

Participants. Forty-eight female undergraduate students volunteered to participate in return for a $5 voucher that could be redeemed at University stores. Unlike in Experiment 1, participants were not required to be non-Christians. Data from 2 participants had to be excluded due to equipment failure and from 1 participant who reported being aware of the hidden video-camera. This left 45 participants.

Materials. The same stimulus materials were used as in Experiment 1. However, as there was no effect of video-tape version in Experiment 1, only two versions of the video-tapes were used. In each version, one clip was of the non-Christian and one of the Christian confederate, each describing a different scene. Half of the participants saw each version.

Implicit liking for the target group – Christians – was assessed using a PC version (Walton, 2003) of the Implicit Association Test (IAT; Greenwald et al., 1998). The IAT stimuli consisted of 5 positive (love, kind, friendly, happy, pleasant) and 5 negative words (nasty, sad, rude, fear, enemy) and 5 photographs of Christians and 5 of non-Christians. Each photograph was of the head and torso of a young woman who was wearing a T-shirt. For the non-Christian women, the T-shirts were each a single color and had no writing or pictures on them. For the Christian women, the T-shirts each had a different Christian slogan printed across the shirt (e.g., "Got God"; "Love God"). The IAT task consisted of 7 blocks of trials with two critical blocks. On each trial the participant was asked to press a response key to indicate from which category the target item, presented in the center of the computer screen, came. The critical blocks involved either congruent trials (Christian and negative words and non-Christian and positive words sharing a response key) or incongruent trials (Christian and positive words and non-Christian and negative words sharing a response key). Each of the critical blocks consisted of 40 trials. The improved algorithm recommended by Greenwald, Nosek and Banaji (2003), was used to calculate the difference in response latency between the congruent and incongruent trials for each participant. A positive IAT indicates that the individual was faster to respond to the incongruent than to the congruent trials and a negative IAT score the reverse. Accordingly, a positive IAT score represents a positive association, or relative liking, of Christians and a negative IAT score a negative association, or relative dislike, of Christians. The absolute value of the IAT score indicates the strength of the implicit association, or liking.

Procedure. The procedure was the same as for Experiment 1. At the end of the computer-based task, however, the participant was only partially debriefed. The participant completed the IAT, then the Affective Thermometer measure and finally the funnel

debriefing questionnaire. The participant was then fully debriefed, asked to provide written consent for the use of the videotape taken during the experiment, and paid.

Results and Discussion

Funnel debriefing revealed that one participant was aware of the hidden video-camera and so her data were removed from the analysis. No other participants indicated any suspicion of the experimental design or predictions. There was no effect of experimental version on any of our dependent measures. Accordingly, this factor is not discussed further.

As in Experiment 1, mimicry scores were calculated for each confederate by subtracting the percentage of face touching in the baseline period from that in the experimental period. Inter-rater reliability between coders was again high ($r(75)=.722$, $p<.0001$). Higher mimicry scores indicate more mimicry of the target behavior in the experimental than the baseline period. Means and distributions of the mimicry scores are shown in Table 1. It is noticeable that mean mimicry for both targets was slightly negative, although there was a range of mimicry scores. This overall lack of mimicry can, however, be explained by considering the relationship between the participants and the targets. As indicated by the liking measures (see below), many participants in this study were positively predisposed toward Christians and many were negatively disposed. It is likely that for some participants the Christian confederate was, as in Experiment 1, seen as an out-group member and hence there was no (or even negative) mimicry of this target whilst there was mimicry of the neutral (non-Christian confederate). For individuals positively pre-disposed toward Christians, however, the Christian confederate may have been seen as an in-group member for whom mimicry should be especially high. For these participants, however, the non-Christian target may have been seen as an out-group member rather than simply as neutral target and hence there was reduced mimicry of this target. Across participants, then, this

may have led to an overall mean of no mimicry of either target. The relationship between liking of the target out-group and mimicry of the out-group confederate accordingly is the major focus of the data analysis for this experiment, as detailed below.

In this experiment, we were interested in whether the extent to which a participant mimicked the Christian confederate could be predicted from the extent to which she liked Christians in general. Liking scores ranged from 22.0 to 100.00 on the explicit liking scale (Affective thermometer) and between -.45 and 1.24 on the implicit liking measure (IAT); higher scores on each liking measure indicating greater liking. There was a moderate correlation between the explicit and implicit liking measures, r (45) =. 55, $p < .05$.

We used a multiple regression analysis using a mimicry difference score (mimicry of non-Christian – mimicry of Christian confederate) as the dependent variable[5]. Details of the mean and distribution of the mimicry difference score are shown in Table 1. As can be seen, the overall mean is slightly positive indicating slightly greater mimicry of the non-Christian than the Christian confederate. There was, however, a large range in the mimicry difference scores, with 20 participants having a negative score indicating overall greater mimicry of the Christian than the non-Christian confederate and 27 having a positive difference score indicating greater mimicry of the non-Christian confederate. The explicit (Affective Thermometer) and implicit (IAT) liking scores were entered as the predictor variables. The regression was significant, F (2,41) = 2.83, $p < .01$; R^2=17.3%. There was a significant positive beta for the explicit liking rating (B=.481, t (41) = 2.83, $p < .01$) and a significant negative beta for the implicit liking rating (B=-.363, t (41) = -2.13, $p < .05$). The higher the liking rating of Christians on the explicit measure, the greater the mimicry difference score, or the less the Christian confederate was mimicked relative to the non-Christian confederate. The higher the IAT score, indicating greater relative liking of the Christian than the non-Christian confederate, however, the lower the mimicry difference

score, or the smaller the difference in the degree of mimicry of the Christian and the non-Christian confederates.

As expected, the degree of mimicry of the Christian confederate could be predicted from both explicit and implicit liking of the target group. Unexpectedly, however, the effect of liking on mimicry was in opposite directions for implicit and explicit liking. Greater explicit liking of the target group predicted less mimicry of the target whilst greater implicit liking predicted higher mimicry. Given the unexpected nature of these findings, especially given the moderate positive correlation between the implicit and explicit liking measures, we conducted some additional analyses to further investigate the effect.

The explicit and implicit liking scores were converted to z-scores and then combined to form two indices. The first was the sum of the z-scores for the two liking measures. Those participants who indicated relatively high liking of Christians on both measures scored highly on this index, those who indicated relatively low liking on both measures scored lowly on this measure and those who had higher liking on one measure than the other had intermediate scores. This measure does not, however, distinguish between those who indicated higher liking on the explicit than the implicit measure and those who show the opposite pattern. The second index was created to differentiate between these two types of participant. This index was computed by subtracting the z-score for the implicit measure from that of the explicit measure. Those who had higher liking on the explicit than implicit measure had a positive index score and those who had higher liking on the implicit measure a negative index score. Participants who had similar ratings on the two liking measures, regardless of whether they were both high or low ratings, had an index score close to zero. These two indices were then correlated with the mimicry difference score used as the dependent variable in the regression analysis reported above. For the first index, the summation liking score, there was no significant correlation with the mimicry difference

scores, r (43) = .099, $p < .50$. For the second index, the difference liking score, there was, however, a significant correlation, r (43) = .413, $p < .01$[6]. This correlation is illustrated in Figure 1.

- insert Figure 1 here -

This pattern of correlations suggests that having a discrepancy between explicit and implicit liking scores and the direction of that discrepancy is important in predicting the difference in mimicry of the two confederates. The lack of any correlation between the summative z-score index and the mimicry difference index indicates that it was not the overall global measure of liking that predicted mimicry level. Rather the nature and direction of discrepancies between the liking measures was important to consider. A negative score on the difference z-score index indicated greater implicit than explicit liking for Christians and a positive score the reverse. The positive correlation with the mimicry difference score indicates that those with stronger implicit than explicit liking had a negative mimicry difference score. That is, these individuals mimicked the Christian confederate to a greater extent than the non-Christian confederate. Those participants with a positive difference z-score, however, mimicked the non-Christian confederate to a greater extent than the Christian confederate. Consistent with the regression analysis, then, it appears as if the implicit liking measure was a stronger predictor of mimicry of the Christian confederate, at least amongst participants with a discrepancy between the two liking measures. A single factor (difference z-score: negative/positive) ANOVA on the mimicry difference score revealed a significant effect, $F(1,41) = 4.56$, $p < .04$. Those with a negative difference z-score had a negative mimicry difference score indicating greater mimicry of the Christian confederate and those with a positive difference z-score had a

positive mimicry difference score indicating greater mimicry of the non-Christian confederate (*Ms* = -4.02 vs. 3.91).

General Discussion

Behavioral mimicry of gestures has been shown to occur non-consciously within social interactions (Chartrand & Bargh, 1999; Chartrand et al., 2002), although such mimicry is not inevitable (Cheng & Chartrand, 2003; Johnston, 2002; van Baaren et al., 2004). The present research further demonstrated the constraints on such mimicry, considering the impact of inter-group factors. Two experiments considered the impact on mimicry of the target (to-be-mimicked) individual being a member of a distinctive social group. Across the two studies we demonstrated that behavioral mimicry is indeed constrained by the social group membership of the interaction partner.

In Experiment 1 we demonstrated that participants mimicked a control confederate more than a member of an out-group, even when the confederates were displaying identical behaviors. This finding is consistent with previous literature that has demonstrated a link between behavioral mimicry and liking of the target individuals. Individuals have been shown to mimic more those they like (Stel et al., 2005), and those with whom they have an affiliation goal (Lakin & Chartrand, 2003), and to like more those who mimic them (Chartrand & Bargh, 1999). Our findings demonstrate a parallel effect for disliked targets. Since out-group members are typically liked less than in-group members and affiliation goals are weaker when interacting with out-group members (Cheng & Chartrand, 2003; Gump & Kulik, 1997), it was not surprising that mimicry of the out-group member was lower than that of the neutral confederate. It was somewhat surprising, however, to see a trend toward a reduction in the target behavior relative to baseline when the behavior was displayed by the out-group confederate. A weaker affiliation goal may actually lead to non-

mimicry rather than to a lesser amount of mimicry. That is, individuals may be less likely to display behaviors that are displayed by out-group members in an attempt to avoid affiliation, or association, with those individuals (Neuberg et al., 1994). Whether such non-mimicry is a consistent effect and its impact on liking and rapport await further research. Reduced mimicry in interactions with out-group members will lead to less rapport developing in such interactions with likely negative implications for the outcomes of such interactions and the likelihood of future encounters. Increasing mimicry in interactions with out-group members may be a useful intervention in improving the nature of such interactions.

Experiment 2 investigated the impact of inter-group liking on mimicry of a distinctive group member. The amount of mimicry of the target, Christian, confederate could be predicted by both a participant's explicit and implicit liking of Christians in general. Interestingly, however, the two liking indices had opposite directions of impact on mimicry. The finding for implicit liking was as predicted. Greater liking was associated with more mimicry of the target, and is consistent with previous research that has demonstrated that we mimic more those who we like and with research that has shown implicit attitudes to predict non-verbal behavior (Dovidio et al., 1997; Fazio et al., 1995; McConnell & Liebold, 2001). The results for explicit liking, however, were contrary to predictions and suggested that greater liking was associated with less mimicry of the target, in contrast to previous research which has demonstrated a positive relationship between explicit liking and mimicry (Chartrand & Bargh, 1999; Lakin et al., 2003; Stel et al., 2005). Further examination of our findings suggested, however, that this negative relationship between explicit liking and mimicry may have been especially evident for those participants who showed a discrepancy between their implicit and explicit liking scores. Previous research investigating the link between liking and mimicry has only reported explicit mimicry scores

and hence it is unclear whether participants in those studies would have shown consistency between implicit and explicit measures of liking for the target.

One possible explanation for our findings may be a rebound-like, or compensatory, effect whereby participants who felt a lack of rapport and warmth with the Christian confederate during the computer-based interaction gave higher liking ratings on the affective thermometer as a compensatory response (Macrae, Bodenhausen, Milne, & Jetten, 1994; Monteith, Spicer, & Tooman, 1998). In making this suggestion we do note the order of our experimental tasks. After completing the mimicry task our participants first completed the implicit (IAT) liking measure and then the explicit (Affective Thermometer) measure. Although participants were unaware of the purpose of the mimicry stage of the experiment, as evident from the debriefing questionnaire responses, by the time that they completed the explicit liking measure they would likely have been primed as to the purpose of the research, or at least the fact that their attitudes toward Christians was relevant. Manipulation of one's liking response is far easier on the explicit than the implicit measure and hence participants could easily deliberately indicate greater liking for the target group than they felt. Such a deliberate compensation type response is consistent with our findings that it was those participants with the greatest positive discrepancy between their explicit and implicit liking scores who showed the greatest relative mimicry of the non-Christian target. Similar compensatory-like effects have been seen in other domains. For example, participants interacting with a stigmatized individual demonstrated a threat pattern of cardiovascular responses whilst those interacting with a non-stigmatized individual demonstrated a challenge pattern of responses. Those interacting with the stigmatized individual, however, subsequently rated their interaction partner, and her performance, more positively than did those who interacted with the non-stigmatized target (Blascovich, Mendes, Hunter, Lickel, & Kowai-Bell, 2001). Although this explanation awaits further

research, it could be speculated, that the effect would be exaggerated in real interaction situations where there is an interchange between interactants rather than having one individual passively watch another.

We should also acknowledge that, unlike past studies, we considered the extent to which participants liked the target group of which the target confederate was a member, rather than liking of the target individual. We also considered a generally disliked target group, whereas past research has generally considered *a priori* neutral targets and considered whether mimicry increases subsequent liking for that target. It is possible that these differences between studies could contribute to the discrepancies reported in the relationship between explicit liking and mimicry. Further, our implicit liking measure (IAT) was a relative measure of liking, or of associating positive constructs with one group (Christians) versus another (non-Christians) whereas the explicit measure was an absolute measure of liking of the target group. It is possible that completing such an absolute measure immediately after completing the relative measure sets up a different context for the participant than completing the explicit measure alone, as in past studies. Further research should consider counter-balancing the order of completion of the implicit and explicit measures or separating their completion across time.

In summary, two experiments have demonstrated the impact of inter-group factors on non-conscious mimicry. A member of an in-group was mimicked to a greater extent than a member of an out-group. Further, the degree of mimicry of a target individual could be predicted from implicit and explicit measures of liking for the social group of which the target is a member. Importantly, however, explicit and implicit liking of the target group had opposite influences on the extent of mimicry of the target individual.

Notes

Behavioral mimicry can also occur as a result of deliberate intention, but such mimicry is not the focus of the present research.

[2] It should be noted that explicit membership of Christian groups is relatively rare in New Zealand.

[3] An analysis using number of face touches rather than the percentage of time touching the face revealed a similar pattern of results. An index of number of face touches per minute was created by subtracting the rate in the baseline period from that in the experimental period. There was a significant effect of target, $F(1,25) = 7.13$, $p < .02$. When watching the non-Christian, participants showed an increase in rate of face touching compared to the baseline but when viewing the Christian confederate the rate decreased relative to baseline. (*Ms* = 1.12 vs. -.61). Full details of means and distributions are shown in Table 1.

[4] Cohen's *d* was calculated using the formula recommended by Dunlap, Cortina, Vaslow, and Burke (1996) for matched groups or repeated measures designs.

[5] The correlation between mimicry scores for the Christian and non-Christian confederate was extremely low, $r(45) = .006$, $p = .97$.

[6] Two similar measures were created from the ranks for each liking score. For each liking measure the scores were ranked from the lowest (least liking) to the highest. These ranks were then summed to form one index – highest scores being obtained by those scored highly on both the implicit and the explicit liking scores. A second index was created by subtracting the implicit ranking from the explicit ranking. As for the z-score indices, there was no correlation between the summed ranking index and the mimicry difference score ($r(43) = .122$, $p = .44$) but a significant negative correlation between the difference rank index and the mimicry difference score ($r(43) = .462$, $p < .01$)

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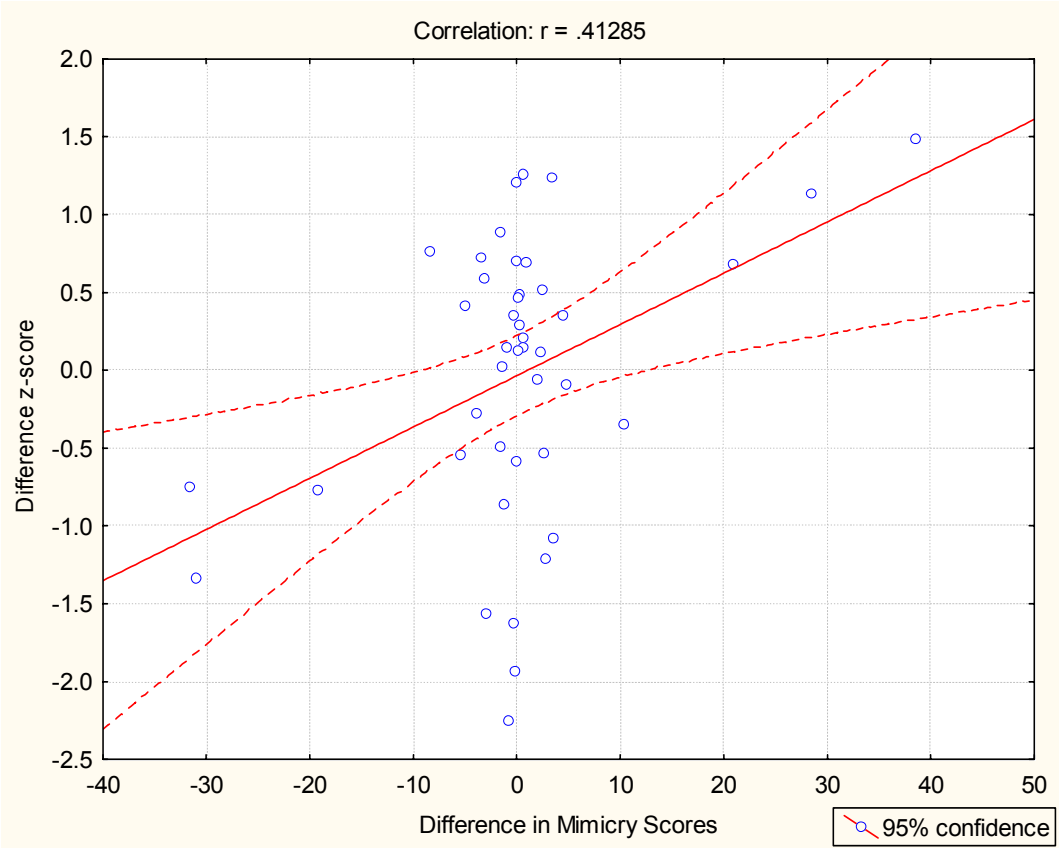

Figure 1.
Scatterplot of difference z-scores (Explicit liking – Implicit liking) against mimicry difference (Mimicry of non-Christian – mimicry of Christian) scores (Experiment 2).

Table 1.
Means, Standard Deviations and Inter-quartile Ranges for Mimicry Scores as a function of Confederate Type.

	Confederate	**Mean**	**SD**	**Inter-quartile Range**
Experiment 1 – Percentage time face touching				
	Non-Christian	5.40	10.24	0 to 7.53
	Christian	-2.69	12.69	-4.08 to 1.39
Experiment 1 – Number of face touches				
	Non-Christian	1.12	3.01	0 to 2.25
	Christian	-.061	2.92	-2 to .50
Experiment 2 – Percentage time face touching				
	Non-Christian	-1.25	7.71	-1.06 to 1.13
	Christian	-1.67	8.07	-.75 to 1.41
Experiment 2 – Mimicry difference scores				
		.34	11.31	-.60 to 2.55