

In-group/out-group bias in contagious yawning by humans

J. Ryan Porter

Steven M. Platek

Psychology, Georgia Gwinnett College, Lawrenceville, GA 30043

Address Correspondence to:

Steven M. Platek,

Psychology, Georgia Gwinnet college

1000 University Center Lane

Lawrenceville, GA, 30043

(splatek@ggc.edu)

Bias for an in-group is a social phenomenon characterized by an affinity for one's in-group over a perceived out-group. Activation in the amygdala, which is implicated in social and emotional processes, is increased when humans view other-race faces [1,2,3,4]. This increase in activation is associated with implicit racial bias as indicated by scores on an implicit attitude test [5]. Contagious yawning is a social process that appears to subserve empathic processes enabling the inferential modeling of the mental states of others [12] and is exhibited in few species other than humans, including chimpanzees (*Pan troglodytes*) [6,7], stump-tail macaques (*Macaca arctoides*) [8], dogs (*Canis familiaris*) [9] (but see [10]), and budgerigars (*Melopsittacus undulatus*) [11]. Despite these comparative data, little research has investigated intra-species variation in contagious yawning [7, 13].

We used a similar experimental design as Campbell and de Wall [7] to investigate a potential in-group bias to contagiously yawn in humans, using race as the independent variable. We hypothesized that participants would show a self-race bias to contagiously yawn.

Sixty (12 male, 48 female, mean age 21.7 years) undergraduate college students served as participants and received course credit for their participation. Individuals were informed that they were participating in a research project investigating perceptions of facial features. Deception was used to prevent potential priming and bias. After their participation, all subjects were fully debriefed and informed of the true purpose of the study. The study was approved by the local Institutional Review Board and all participants gave written informed consent.

Subjects completed a demographic information questionnaire, which included a question to self-identify on race. Since the stimuli used in this study were only of Caucasian

(C) and African American (AA) races, any participants not identifying themselves as belonging solely to one race or the other were excluded from final data analysis. This left us with 43 participants (5 W males, 19 W females; 2 AA males, 17 AA females) suitable for statistical analysis.

A total of 12 videos, ranging in duration from 5 seconds to 8 seconds, of 4 volunteers (C male, C female, AA male, AA female) were recorded in three separate conditions (yawning, smiling, or neutral) using an Apple MacBook Pro's integrated iSight camera. The stimuli were presented to participants via a Microsoft PowerPoint presentation. The presentation was set to an automatic timer so that the participant was required only to watch the screen. Each presentation followed a similar format. Individual stimuli (either C male, C female, AA male, or AA female) were blocked into 30 second segments, each averaging 4 yawns. Before and after each segment, either a smile video or neutral face video of the same stimuli was presented. The order that the blocks were inserted into the presentation was randomized and the experimenter was blind to the order of stimuli in the presentation.

While subjects viewed the presentation, an experimenter surreptitiously observed them through a two-way mirror. The experimenter coded the behavior of the subject (yawn, smile, other, or no behavior) and the sex and race of the volunteer in the segment being viewed at the time of the behavior.

Across all 60 subjects, 22 showed evidence of contagious yawning (36.7%), which is consistent with previous studies [12,14]. Of the 43 subjects included in final analysis, 15 yawned (34.8%; 3 W males, 7 W females; 5 AA females). A 2(sex of participant) x 2(race of stimuli) x 2(sex of stimuli) repeated measures analysis of variance (rmANOVA) indicated

that there was no main effect and also no interaction between sex of participant and sex of stimuli ( $F(1,38)=1.21, p=0.28, \eta^2=.031$ ). However, there was an interaction of race of participant and race of stimuli ( $F(1,38)=5.141, p<0.05, \eta^2=.119$ ; see Figure 1) showing African Americans were more likely to yawn to stimuli depicting African Americans and the same was true for Caucasians.

Research on the social role of contagious yawning in humans is lacking [13]. Here, we have provided evidence of possible in-group bias to contagious yawning. These results suggest an empathic link associated with contagious yawning and are in-line with those found in chimpanzees [7].

Genetic similarity theory [15,16] posits that genes favor other organisms in which their copies reside. That is, an individual is more likely to associate with and be altruistic towards others (kin, members of the same race; 17) who are phenotypically similar because it is more likely that those particular others share genes in common with oneself. In this light, these findings provide an ultimate explanation for the link between empathy and the susceptibility to yawn contagiously [12]. Individuals of the same race may be evolutionarily predisposed to altruistically prefer each other, i.e., empathy towards similar individuals promotes group unity and welfare. Krill and Platek [17] provide indirect evidence for this claim by showing that social exclusion causes increased social pain when delivered by a member of the same race and causes virtually no social pain when delivered by an other race.

In spite of this potential insight, our study has its limitations. First, we recruited a convenience sample of college undergraduates who were required to participate in a research study. Second, females outnumbered males in our study by a ratio of 4:1. Despite

these shortcomings, we believe that this study provides legitimate evidence for an in-group bias to contagiously yawn. More research needs to be done to replicate and extend these findings.

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**Figure 1.** In-group bias of race for contagious yawning.

