



## Original Article

# It's funny because we think it's true: laughter is augmented by implicit preferences

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**Abstract**

This study tests the folk psychological belief that we find things funny because we think they are true. Specifically, it addresses the relationship between implicit preferences and laughter. Fifty-nine undergraduate Rutgers University students (33 females and 26 males) from ethnically diverse backgrounds were videotaped while watching a white stand-up comedian for 30 min. Positive emotional expression associated with laughter was later scored using the facial action coding system (FACS). Computer-timed Implicit Association Tests (IATs) were used to measure a subject's implicit preferences for traditional gender roles and racial preferences (blacks vs. whites). Results show that participants laughed more in response to jokes that matched their implicit preferences (e.g., those with stronger implicit preferences for whites laughed more at racially charged material). Implications for the evolution of humor, and laughter as a hard-to-fake signal of preferences, are discussed.

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**Keywords:** Facial Action Coding System; Implicit Association Test**1. Introduction**

In an episode of the *Simpsons*, Homer makes a toast, “To alcohol! The cause of, and solution to, all of life's problems” (Groening, 2004). One way to interpret this joke is that the reason some people find it funny is that it is both surprising — making a toast to alcohol with alcohol while lauding the benefits of drunkenness — and that it illuminates an inherent contradiction: alcohol is both a problem and a solution to life's problems. In this joke, we are forced to confront opposing beliefs about alcohol. In this interpretation, it is the recognition of the two contradictory beliefs that ignites laughter. It may also be the case, however, that some individuals find the joke funny because they have experience with the truth of both claims without referencing the surprise aspect or the contradiction of Homer's toast. Why would some individuals find this joke funny and laugh and others not? George Meyer, a lead writer for the *Simpsons*, says appreciating humor is “like seeing in two dimensions and then opening the other eye or looking through a View-Master

and suddenly seeing in three” (Owen, 2000). ‘Getting the joke,’ however, may require the recognition of either the contradiction or implicit agreement with the ‘truth’ revealed by the joke, and this may rely on what someone believes is true. Comedians often start with the standard, “you ever notice that...” and then encourage us to identify with their observation. Their success may be determined by whether or not we agree with their observation.

Researchers from a wide range of disciplines have suggested that laughter has a role in facilitating in-group bonds. Laugh tracks amplify laughter only when individuals believe it comes from members of an in-group (Platow et al., 2005). If contagious laughter does not extend to out-group members, it may have a function in reinforcing social group bonds. People tend to like others who laugh and share their sense of humor (Fraley & Aron, 2004; Reysen, 2005; Sprecher & Regan, 2002), and laughter is more common in the presence of others (Malpass & Fitzpatrick, 1959; Martin & Kuiper, 1999; Provine & Fischer, 1989), indicating that it may be connected to both social bonding and communication. It has also been shown to increase more in the presence of friends than of strangers, further indicating that it is mediated by group affiliation (Devereux & Ginsburgh,

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2001). Laughter is also likely to play an important role in mate choice. In opposite sex encounters, laughter has been shown to indicate sexual interest (Grammer, 1990). Indeed, the high value that humans place on sense of humor when choosing an opposite sex mate, often outranking physical attractiveness (Buss & Barnes, 1986; Feingold, 1981; Goodwin, 1990; Hendel, 1978), indicates that it may have an important function in signaling important information about another's quality or compatibility. Miller (2000) argues that humor evolved through sexual selection and was a way of honestly signaling intelligence and creativity to potential mates.

Laughter is an extremely difficult behavior to study empirically. It can be instigated by humor, but some studies have indicated that laughter may have little to do with humor. Provine (2000) found that less than 20% of conversational laughter followed anything that he or his assistants were able to recognize as humor. However, if many jokes require the laughter to have inside information and are taken out of context, it may be that Provine was unable to understand many of the jokes he claims did not involve humor. Despite this caveat, some proportion of the laughter he recorded was unlikely to have been instigated by humor. Straight lines such as "I'll see you guys later" which were followed by laughter are unlikely to require in-group status to decode. Additional factors affecting laughter may include power, gender and social status (Stillman, Baumeister, & DeWall, 2007). Furthermore, laughter, in response to humor, is often activated spontaneously, beyond purposeful or deliberate control. Researchers from a wide range of disciplines have long noticed the importance of involuntary processes in laughter (Coulson & Wu, 2005; Fried, Wilson, Katherine, & Behnke, 1998; Moran, Wig, Adams, Janata, & Kelley, 2004; Ramachandran, 1996; Shammi & Stuss, 1999). Some have suggested that researchers should distinguish between involuntary, Duchenne laughter, and purposeful, non-Duchenne laughter, when considering the evolution of the laughter signal (Gervais & Wilson, 2005). All of these factors make the objective study of laughter difficult.

Until recently, laughter was regarded as a uniquely human phenomenon. Laughter-like behavior has now been reported in chimpanzees (Provine, 1996) and rats (Knutson, Burgdorf, & Panskepp, 2002). Chimpanzees utter laugh-like sounds when they are tickled and engage in play panting when they are being chased. As in human children, it is the one being chased that laughs. Research on wild chimpanzees provides evidence that play panting may serve as a signal the interaction is not perceived as threatening and play can continue (Matsusaka, 2004).

The ubiquity of laughter and humor across all human cultures, its importance in mate choice, in-group bonding and potentially deep phylogenetic roots all point to an evolutionary function for this behavior. Owren and Bachowski (2001) propose that laughter evolved in humans because it facilitated cooperative relationships among nonkin, and Weisfield (1993) suggests that humor functions

to promote learning through social behavior). Flamson and Barret (2008) similarly argue that humor functions as an honest signal which serves to identify other individuals with similar knowledge, attitudes and preferences. They hypothesize that humor evolved to broadcast information about one's self. Humor is often purposefully oblique or 'encrypted' (the lock), and only those with the same knowledge (the key) are able to decode the message. In this way, the humor producer encodes the humor and only those with the same background knowledge are able to decode it and laugh at the joke. Their hypothesis provides an explanation for what is often the deliberately obscure nature of humor and how it differs from other forms of communication. Furthermore, it may incorporate other hypotheses regarding the function of humor, such as the theory that humor involves the violation of expectations (incongruity resolution), as being just another way to cleverly encrypt a message. Another related possibility is that laughter enhanced early hominid's ability to communicate and signal positive emotion, thus improving their chances of being accepted into social groups (Baumeister & Leary, 1995). Clarke (in press) argues that humor is evoked by the surprise recognition of a pattern and rewards cognitive development (e.g., the recognition of novel patterns in the environment). It later evolved as an external signal (laughter) which allows this ability to be advertised in an involuntary and honest manner.

An evolutionary theory may explain why we laugh but it cannot explain what is objectively funny, since nothing is inherently funnier than anything else. Here, the individual is of paramount importance; individual differences in personality, memories and beliefs may play an important role in what we find humorous. In humans, whether or not we laugh may signal something about our unconscious preferences or beliefs; and sharing the joke teller's biases may be important in our response to a joke. Stand-up comedy relies on one person, often without props; a microphone; and an audience. It is unique in that there are no other confounding influences on the humor, and it is clear who is appealing for our complicity in the joke. Clarke argues that stand-up comedy often features what he calls the 'it's so true' form of humor (Clarke, in press). He claims that the observer's response will partly depend on the similarity between the image retained by his or her own brain and that depicted by the comedian. So the comparison may depend on the implicit preferences of the audience. If the comparison is perceived as being accurate, the response will be greater.

Conventional wisdom has it that we often find things funny because we think they are true. To date, however, this folk psychological belief has never been scientifically examined. Although the Flamson and Barret (2008) study provides support for the hypothesis that humor signals in-group status by way of advertising shared knowledge between the humor producer and receiver (laughter), it does not empirically address whether or not humor signals shared preferences or beliefs. This is the first study to empirically examine the often heard claim that things are funny because

we think they are true. Importantly, we are not testing the claim that something is funny because it is objectively true. Rather, do we find something humorous because we think it is true? If the folk psychological belief that we find things funny because we think they are true is correct, then we should expect that our response to humor will be content specific, and that humor targeting particular implicit preferences or beliefs should result in more laughter by those individuals with these implicit preferences or beliefs.

## 2. Methods

Fifty-nine undergraduates from diverse backgrounds (26 males, 33 females — 36 Caucasians, 21 Asians and two African Americans) from an introductory anthropology course were selected for the study and offered extra credit (5% added to their final) in exchange for their participation. Each participant was videotaped while watching a 30-min video of stand-up comedian Bill Burr's HBO special and took two computer-based Implicit Association Tests (IATs). The order of the tasks was counterbalanced between watching the video and the IATs.

### 2.1. Facial Action Coding System

The facial expressions were recorded applying the seventh version of the Emotion Facial Action Coding System (EMFACS-7), developed by W.V. Friesen and P. Ekman on the basis of the Facial Action Coding System (FACS; Ekman & Friesen, 1978). Both FACS and EMFACS are comprehensive, anatomically based, techniques for objectively measuring facial expressions. Each facial movement is assigned a code called an action unit (AU). While FACS records intensity, duration and type of action unit for

all 44 discernible facial expressions, EMFACS allows a coder to only record action units related to emotions relevant to the study. The present study employed EMFACS and concentrated on four AUs suggested by P. Ekman (personal communication, 2006) to be specifically involved in laughter.

The principal investigator is certified to use the FACS and passed the FACS's final exam to obtain certification. AUs 6 and 7 (tightening of ring muscles around the eyes), AU 12 (raising of outer lip corners) and AU 14 (tightening of outer lip corners) have previously been identified as markers of positive emotion and are expressed during laughter. These were the only AUs scored for this study. These four AUs were scored for intensity, duration and type (AU number), for each individual frame (30 frames per second) and for all coded sections of the videotape. As suggested by the EMFACS manual, only intensity levels 2–5 were recorded as mistakes can be made when attempting to discern minute facial movements required for coding a low-intensity level of 1.

It was not expected that implicit preferences should correlate with the intensity or duration of laughter across the entire routine but should only correlate with specific areas of comedic content. There is any number of reasons why an individual might like a particular comedian or stand-up comedy in general, more or less than another, and these individual differences may be entirely unrelated to implicit preferences. As a result, it was necessary to compare the EMFACS for different segments of the routine, so the scoring of participants was divided into three segments of 160 s each. Each segment was selected for content and reflected a control section, a gender differences section and a racial differences section. For each segment (160 s or 4800 frames each), AUs and intensity were recorded. As

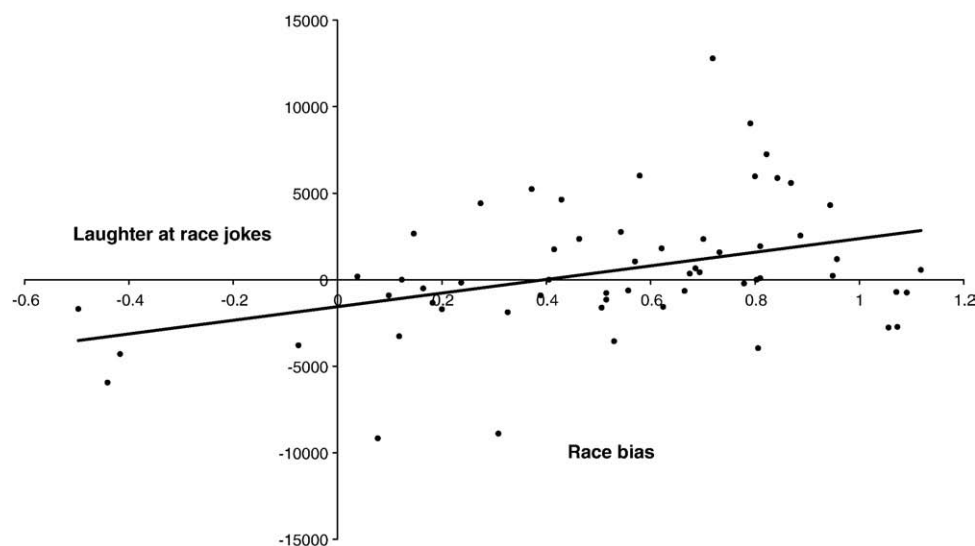


Fig. 1. IAT scores on race preferences plotted against facial expressions associated with laughter in response to the comedian talking about racial differences. On the y-axis, higher numbers indicate participants who laughed more at jokes pointing out racial differences in comparison to a control. On the x-axis, higher numbers indicate an implicit preference for whites.

previously stated, intensity for each frame was designated on a scale of 2–5 with 5 being the most intense. All scores for all frames were summed for each AU, and participants were given a score that reflected the intensity and duration of each AU recorded. In order to analyze the relative amount of laughter during the sex differences jokes and race jokes segments of the routine separately, the EMFACS scores for the control segment were subtracted from both the race jokes segment and the gender roles segment of the routine. In this way, laughter in response to these two specific areas of comedic content could be isolated independently from a participant's total amount of laughter.

## 2.2. Implicit Association Tests

The IAT records an individual's response time and error rate while being asked to categorize different stimulus items into different combinations of categories (Greenwald, McGhee, & Schwartz, 1998). The test is widely used to reflect the strength of someone's associations. The test may be tapping into unconscious or semiconscious preferences that are often different from explicit or self-reported preferences.

Two computer-based IATs were completed by all participants. The tests were constructed by Rolando Deaguiar, a Rutgers graduate student, to work on local computers and to record a participant's response rate. The tests were identical to the Race IAT and Gender-Career IAT designed by Nosek, Banaji, and Greenwald (2002). Both tests are available at the project implicit website (<https://implicit.harvard.edu/implicit/demo/selectatest.html>). The first was a race attitude IAT and measured the strength of association between the categories good or bad, and black or white. The

Table 1

Descriptive statistics for key variables used in study

	<i>n</i>	Mean	S.D.
Gender IAT score	59	.37	.311
Race IAT score	59	.53	.378
EMFACS			
Race segment	59	3006	3856
Gender segment	59	3236	3189
Control segment	59	3526	3439

test used black faces, white faces, good words (i.e., peace, happy) and bad words (i.e., horrible, death) as stimuli. There were two blocks of practice trials. In the first, participants were asked to use the keyboard (letters 'd' and 'k' for left and right sides of the screen, respectively) to categorize black or white faces that pop up in the middle of the screen with the words black or white which were, in alternate trials, displayed on the upper right or upper left side of the computer screen. If an error was made, a red 'x' appeared on the screen and the subject had to put the face or word in the correct category before continuing. In the second block of practice trials, participants categorized words such as 'peace' and 'love' into the category good and words such as 'evil' and 'war' into the category bad, which again are alternately displayed on the upper left or right side of the screen. Once the subject performed satisfactorily on the test and understood the task, he or she was asked to categorize the stimuli (images of black faces, white faces, good words and bad words) into combined categories such as {good, black} or {bad, white}. The computer recorded the latency of the

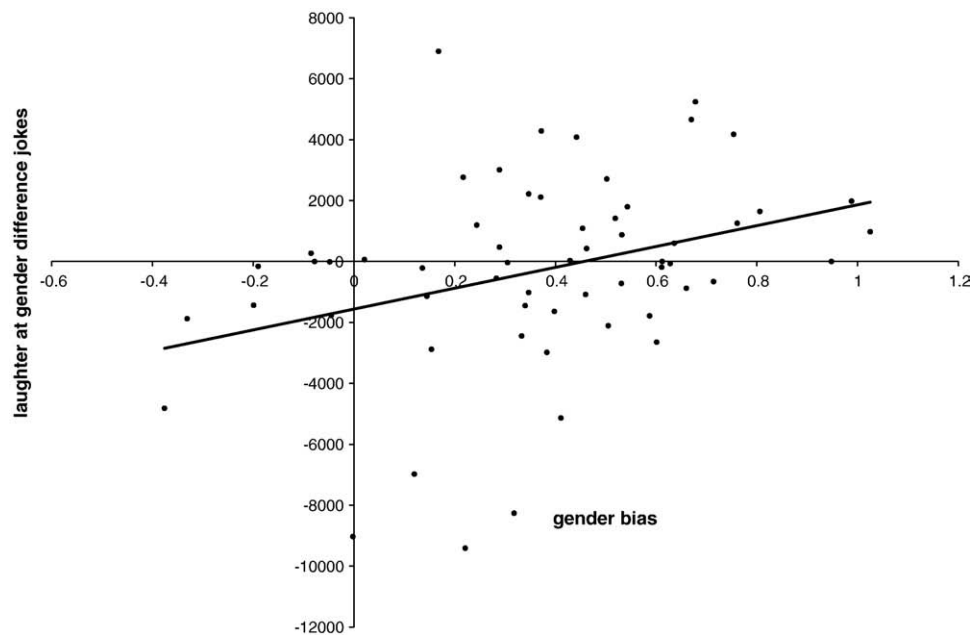


Fig. 2. IAT scores on gender role preferences plotted against positive facial expressions associated with laughter during the sex differences segment of the comedy routine. On the y-axis, higher numbers indicate participants who laughed more in response to jokes pointing out gender differences as compared to a control. On the x-axis, higher numbers indicate an implicit preference for males and career and females with family.



subject's response time and error rate. Next, the categories were switched such that the stimulus items had to be categorized into either {good, white} or {bad, black}. Again, the computer recorded latency and error rate. Finally, the combined labels were switched to the opposite side of the screen and the two trials were repeated. The order of the combined categories, side of the screen and order of the stimuli were randomized for each subject.

The second IAT was a 'gender–career stereotype IAT' and measured association strength of male and female with career and family. The labels or categories were alternatively {male, career}, {family, female}, {career, female} and {male, family}. Examples of the stimulus items to be categorized with male or female were 'John,' 'Sarah,' 'Steve' and 'Kate' (see Appendix A for a list of all stimulus items for both race and gender IATs). Stimuli for career or family included the words 'Home,' 'Professional,' 'Marriage' and 'Business.' Again, two blocks of practice trials were first conducted to ensure the subject understood the task and the timed trials were randomized for both which side of the screen the labels were placed (upper left or upper right) and the different combinations of categories [i.e., {female, career}, {male, family}, {male, career} and {female, family}].

All participants were instructed to complete the tests as quickly as possible while minimizing mistakes, both orally from the PI and in written instructions on the computer screen. The participants were then left alone in a room to complete each test. Each IAT took approximately 10 min. The IATs were scored with the new scoring algorithm (Nosek, Greenwald, & Banaji, 2005) and higher scores indicate faster associations with the stereotyped categories. For example, a higher score on the race IAT reflects greater latency and errors in categorizing good words with the combined category {black, good} than with the combined category {white, good}; and slower categorization of bad words with the combined category {white, bad} than with the combined category {black, bad}. On the gender IAT, higher scores reflect greater latency and errors in categorizing career words with the combined category {career, female} than with the combined category {career, male}; and slower categorization of family words with the combined category {male, family} than with the combined category {female, family}.

### 2.3. Comedy routine

Participants were seated alone in a room and videotaped while watching the comedian Bill Burr's half-hour HBO special which was publicly available on his website (go to: <http://www.billburr.com/audioVideo.shtml> to watch the HBO special *One Night Stand* used in this study) (Burr, 2006). This comedian is known for engaging the audience with taboo topics such as gender roles and race and is popular among college students. In addition, the comedian is a white male making fun of topics usually reserved for black or female comedians. The control section was the first 2 min 40 s (4800 frames) of the stand-up routine, and

the material included a mix of jokes about the Olson twins, divorce, anorexia and skydiving among others. Importantly, none of the control section included jokes related to sex or racial differences. All of the jokes that were EMFACS scored for the gender roles involved why men do, and should, make more money than women for doing the same job. The EMFACS-coded racially charged material involved the comedian talking about how dangerous and frightening it is for whites to go into black neighborhoods like Harlem (see online supplementary material videos 1–3 for coded segments of the routine). After being seated in front of the screen, participants were given no further directions except to watch the routine and let the principal investigator know when it was over.

Both IATs and FACS were used to avoid the problems of self-reports, which can be biased or inaccurate for any number of reasons. There is a growing body of evidence that both IATs (Greenwald, Nosek, & Banaji, 2003) and certain facial expressions, particularly AU6, also known as the 'Duchenne smile' (the squinting of the outer eye) (Ekman, Davidson, & Friesen, 1990), are difficult to fake and rely on involuntary or unconscious processes (see Table 1 for descriptive statistics for EMFACS and IAT scores).

### 3. Results

The total EMFACS scores for gender differences jokes minus the control jokes were significantly and positively correlated with scores on the gender preferences IAT ( $r=.334$ ,  $N=59$ ,  $p=.010$ ) (see Fig. 2 and Table 2). So participants who more strongly associated males with career and females with family (traditional gender roles) showed greater positive affect in response to the gender differences jokes than those who showed this association less strongly. The association strengthened marginally when AU 6, which is involved in the Duchenne smile and is considered to be involuntary, was isolated independently of the other AUs ( $r=.345$ ,  $p=.008$ ) (see Table 2).

Table 2  
Correlations between sex and implicit preferences for Duchenne and non-Duchenne laughter

	Sex IAT score	Race IAT score
All EMFACS for sex minus control segments	.334** (.010)	.275* (.035)
All EMFACS for race minus control segments	.218 (.097)	.385** (.003)
AU 6 only for sex minus control segments	.345** (.008)	.288* (.027)
AU 6 only for race minus control segments	.241 (.066)	.404** (.001)

Data in parentheses are  $p$  values.

\*  $p<.05$ .

\*\*  $p<.001$ .

The EMFACS scores for the race jokes minus the control jokes were significantly and positively associated with scores on the race preferences IAT ( $r=.385$ ,  $N=59$ ,  $p=.003$ ) (see Fig. 1 and Table 2). So participants who more strongly associated good with white and bad with black showed greater positive facial affect in response to the racially charged humor than those with a weaker preference for whites over blacks. Again, this association was marginally strengthened when only AU 6 was used ( $r=.404$ ,  $N=59$ ,  $p=.001$ ) (see Table 2).

As expected, there was a significant and positive correlation between all of the coded segments of the routine. Participants who like Bill Burr or like stand-up comedy in general showed greater positive facial affect across all parts of the routine. EMFACS score for the control segment was significantly and positively correlated with that for the race segment ( $r=.520$ ,  $N=59$ ,  $p=.000$ ) and that for the gender segment ( $r=.592$ ,  $N=59$ ,  $p=.000$ ). EMFACS score for the race segment and that for the gender segment were also significantly and positively correlated ( $r=.660$ ,  $N=59$ ,  $p=.000$ ). There was also a significant correlation between the sex differences jokes minus the control jokes and the race differences jokes minus the control jokes ( $r=.570$ ,  $N=59$ ,  $p=.000$ ).

The race IAT scores were significantly and positively correlated with the EMFACS score for the gender minus control jokes ( $r=.275$ ,  $N=59$ ,  $p=.035$ ) (see Table 2). This means that participants who associated black with bad and good with white also showed greater positive facial affect in response to the segment on gender biases. This last correlation may be a function of certain individuals enjoying taboo topics or politically incorrect humor more than others. The control jokes, however, were not significantly correlated with the gender IAT ( $r=-.073$ ,  $N=59$ ,  $p=.597$ ) but were significantly and negatively correlated with the race IAT scores ( $r=-.331$ ,  $N=59$ ,  $p=.010$ ). So the correlation between the race IAT and the EMFACS for the race minus control segments is in large part determined by participants who scored high on the race IAT laughing less at the control section than by others.

There were also significant gender-specific associations for the IAT scores. Females showed stronger positive associations between males and careers and females and family ( $r=.268$ ,  $N=59$ ,  $p=.040$ ) than males, and males showed stronger associations between black–bad and good–white than females ( $r=.330$ ,  $N=59$ ,  $p=.011$ ). So females showed stronger traditional gender role biases than men, and men showed stronger preferences for whites than women. These results replicate earlier findings from a much larger sample size (Nosek et al., 2002). There were, however, no significant correlations between sex and laughter for any of the coded segments of the routine, although this may be due to the relatively small sample sizes which are intrinsic to the time-consuming nature of using FACS. Although no a priori predictions were made regarding sex differences in total laughter, the potentially sexist nature of some of the material makes this analysis useful. So a multiple regression using sex as a factor (see Table 3) was run to determine whether the sex

Table 3

Regression of sex and IAT score on EMFACS coded laughter for the sex minus control segments and the race minus control segments

	Model $R^2$	$F$	$T$	$p$ value
EMFACS for sex jokes minus control segments	.118	3.729		.006
Sex			-.629	.532
Race IAT score			3.322	.002
EMFACS for race jokes minus control segments	.165	5.542		.030
Sex			1.058	.294
Gender IAT score			3.322	.002

of the participant was impacting on the main results. Sex of the participant does not significantly affect the results for either the race jokes ( $t=1.058$ ,  $N=59$ ,  $p=.294$ ) or the gender differences jokes ( $t=-.629$ ,  $N=59$ ,  $p=.008$ ) (see Table 3). It was impossible to use ethnicity as a factor because of the relatively small sample size and the multicultural makeup of the course. There were only two African Americans and the Asian category included students from Japan, China, India, Sri Lanka, Pakistan, Thailand, Vietnam and Cambodia.

It may be that there is an important distinction between short but intense responses and continuous low-level responses to the jokes. In order to determine whether the method of summing all EMFACS scores across all frames was appropriate, I used the frequency of laughter (how many times the participant laughed) instead of the total, summed EMFACS scores across an entire coded segment. Using frequency of laughter instead of total laughter produced nearly identical results. Frequency of laughter (distinct periods in which EMFACS scores were coded as 2 or higher) was highly correlated with the total summed EMFACS scores. The frequency of laughter across all three segments was significantly correlated with the combined total EMFACS ( $r=.759$ ,  $N=59$ ,  $p=.000$ ) as were the correlations between frequency and total for each individual segment: control frequency and control total ( $r=.788$ ,  $N=59$ ,  $p=.000$ ); gender bias frequency and gender bias total ( $r=.743$ ,  $N=59$ ,  $p=.000$ ); and race bias frequency and race bias total ( $r=.628$ ,  $N=59$ ,  $p=.000$ ).

#### 4. Discussion

The primary result was that the magnitude of the laughter response was specific to the content of the jokes and the implicit preferences of the participants. Participants laughed more in response to specific bits which matched their implicit preferences. Implicit preferences may play an important role in an individual's response to different types of humor or specific jokes. If implicit preferences affect our response to humor, then laughter may serve as a signal that we share the joke teller's beliefs, biases or preferences.

An important strength of this study is that it directly measures behavior and does not rely on self-reports. Although Flamson and Barret (2008) report similar results

for a correlation between shared knowledge and higher ratings of humor in support of their encryption theory of humor, their studies rely on self-reports. Simply asking the subjects if they thought the comedian was funny would have been easier. Here, however, the focus was not on internal states or reports on these states. This may be particularly important when attempting to measure nonverbal communication. If laughter is a signal, then whether or not the participant found the comedian funny or not is less important than the perception of the signal by others. Because we do not have access to the internal states of others, we often rely on their facial expressions. Although there are many ways to measure laughter, FACS has the benefit of being a reliable, repeatable and objective method for measuring facial movements which may be of particular importance when measuring nonverbal communication such as laughter. FACS also enables one to distinguish between voluntary (non-Duchenne) and genuine emotion-filled, involuntary (Duchenne) laughter which may be more important in social settings considering research, suggesting that there may be reasons for laughter other than humor (Provine, 2000; Stillman et al., 2007). IATs are similarly construed and are a repeatable, objective method for analyzing behavior rather than explicitly stated attitudes.

Humor has been shown to be important in mate choice and may function to facilitate in-group bonds, ostracize outgroups and either reinforce or disrupt hierarchies (Alexander, 1986; Allen, Reid, & Riemenschneider, 2004; Pinker, 1997; Stillman et al., 2007). To my knowledge, however, this is the first study to objectively investigate what different individuals find funny and why. Laughter is an extremely complicated behavior and any firm conclusions are premature. One limitation of this study is the fact that all the participants viewed the 30-min comedy routine in the same way. Ideally, the order of the coded segments should have been counterbalanced in case there were threshold effects on laughter (laughing at early jokes may have caused participants to laugh more easily at later jokes). It is unclear what impact counterbalancing the order would have had on these results, but cutting the video into parts and reordering them would have severely damaged the coherent and continuous nature of the routine and was therefore not possible. This study, however, provides direct empirical evidence connecting implicit preferences with laughter. Owren and Bachorowski (2001) argue that laughter first evolved as an honest signal which was later subject to manipulation and deceit by non-Duchenne, volitional smiling. Other researchers have also noted the importance of teasing apart spontaneous, involuntary and emotion-filled facial movements from the contrived and voluntary (Gervais & Wilson, 2005). Genuine emotion-felt laughter is likely harder to fake and it is interesting to note that the strength of all correlations improve slightly when AU6 (the Duchenne smile) is isolated from the other AUs.

Finally, the specific finding that implicit preferences affect our response to the material of a stand-up comic may have

broader implications that apply to other types of humor. Stand-up comedy tends to rely on “it’s so true humor” (Clarke, in press), but we might expect laughter to be an honest signal of implicit preferences for all types of humor, including puns, sarcasm and slapstick. Further research is needed to determine whether the results presented here apply to other types of humor. Do implicit preferences predict an individual’s response to images of animals dressed up as humans? Whether laughter originally evolved as a reward for pattern recognition, a mechanism for facilitating social bonds or a means for maintaining and consolidating in-groups, it may have acquired the additional function of honestly signaling preferences. Whether or not this signal is open to manipulation by volitional laughter will require further research, but it is likely that laughter serves an important function in nonverbal communication. Because certain aspects of laughter, such as the Duchenne smile, are likely involuntary, laughter may serve as an important signal that is less susceptible to manipulation and deceit than is verbal communication.

Our biases and preferences play an important role in our sense of humor. Sharing a sense of humor is important in mate selection and facilitating social bonding and as shown here may help to assess in-group status or potential mates by determining when others share your biases or beliefs. Combined, these results provide support for the folk psychological belief that it’s funny because (we think) it’s true.

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## Appendix A

### *Race attitude IAT*

Category/labels	Stimuli
Black	6 black morphed faces (3 male, 3 female)
White	6 white morphed faces (3 male, 3 female)
Evaluative labels	
Good	Joy, love, peace, wonderful, pleasure, friend, laughter, happy
Bad	Agony, terrible, horrible, nasty, evil, war, awful, failure, death

### *Gender-Career Stereotype IAT*

Gender labels	Stimuli
Male	John, Paul, Mike, Kevin, Steve, Greg, Jeff, Bill
Female	Amy, Joan, Lisa, Sarah, Diana, Kate, Ann, Donna
Associative labels	
Career	Executive, management, professional, corporation, salary, office business, career
Family	Home, parents, children, family, cousins, marriage, wedding, relatives

Video used: <http://www.billburr.com/audioVideo.shtml>.



## Appendix B. Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.evolhumbehav.2009.07.003.

## References

- Alexander, R. D. (1986). Ostracism and indirect reciprocity: The reproductive significance of humor. *Ethology and Sociobiology*, 7, 253–270.
- Allen, W. F., Reid, M., & Riemenschneider, C. (2004). The role of laughter when discussing workplace barriers: Women in information technology jobs. *Sex Roles: A Journal of Research*, 50(3–4), 177–189.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117, 497–529.
- Burr, W. (2006). HBO website. <http://www.billburr.com/audioVideo.shtml>.
- Buss, D. M., & Barnes, M. (1986). Preferences in human mate selection. *Journal of Personality and Social Psychology*, 50, 559–570.
- Clarke, A. (in press). Humour. Pyrrhic house.
- Coulson, S., & Wu, Y. C. (2005). Right hemisphere activation of joke-related information: An event-related brain potential study. *Journal of Cognitive Neuroscience*, 17(3), 494–506.
- Devereux, P. G., & Ginsburg, G. P. (2001). Sociality effects on the production of laughter. *Journal of General Psychology*, 128(2), 227–240.
- Ekman, P., Davidson, R., & Friesen, W. (1990). The Duchenne smile: Emotional expression and brain physiology II. *Journal of Personality and Social Psychology*, 58, 342–353.
- Ekman, P., & Friesen, V. W. (1978). *Facial Action Coding System (FACS): Manual*. Palo Alto: Consulting Psychologists Press.
- Feingold, A. (1981). Testing equity as an explanation for romantic couples “mismatched” on physical attractiveness. *Psychological Reports*, 49, 247–250.
- Flamson, T., & Barrett, H. C. (2008). The encryption theory of humor: A knowledge based mechanism of honest signaling. *Journal of Evolutionary Psychology*, 6(4), 261–281.
- Fraley, B., & Aron, A. (2004). The effect of a shared humorous experience on closeness in initial encounters. *Personal Relationships*, 11, 61–78.
- Fried, I., Wilson, C. L., Katherine, A. M., & Behnke, E. J. (1998). Electric current stimulates laughter. *Nature*, 391(6668), 650.
- Gervais, M., & Wilson, D. S. (2005). The evolution and function of laughter and humor: A synthetic approach. *Quarterly Review of Biology*, 80(4), 395–430.
- Goodwin, R. (1990). Sex differences among partner preferences: Are the sexes really very similar? *Sex roles*, 23, 501–513.
- Grammer, K. (1990). Strangers meet: Laughter and non-verbal signs of interest in opposite-sex encounters. *Journal of Nonverbal Behavior*, 14, 209–236.
- Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. *Journal of Personality and Social Psychology*, 74, 1464–1480.
- Greenwald, A. G., Nosek, B., & Banaji, M. R. (2003). Understanding and using the implicit association test: I. An improved scoring algorithm. *Journal of Personality and Social Psychology*, 85(2), 197–216.
- Groening, M. (2004). *The Simpsons*. Los Angeles, CA: Fox Television.
- Hendel, D. D. (1978). Mate selection values of high school and college students. *Counseling and Values*, 22, 127–133.
- Knutson, B., Burgdorf, J., & Panskepp, J. (2002). Ultrasonic vocalizations as indices of affective states in rat. *Psychological Bulletin*, 128, 961–977.
- Malpass, L. F., & Fitzpatrick, E. D. (1959). Social facilitation as a factor in reaction to humor. *Journal of Social Psychology*, 50, 295–303.
- Martin, R. A., & Kuiper, N. (1999). Daily occurrence of laughter: Relationships with age, gender, and Type A personality. *International Journal of Humor Research*, 12, 355–384.
- Matsusaka, T. (2004). When does play panting occur during social play in wild chimpanzees? *Primates*, 45, 221–229.
- Miller, G. F. (2000). *The Mating Mind: How Sexual Choice Shaped the Evolution of Human Nature*. (1st ed.) New York: Doubleday.
- Moran, J. M., Wig, G. S., Adams, R. B., Jr., Janata, P., & Kelley, W. M. (2004). Neural correlates of humor detection and appreciation. *NeuroImage*, 21(3), 1055–1060.
- Nosek, B. A., Banaji, M. R., & Greenwald, A. (2002). Harvesting implicit group attitudes from a demonstration website. *Group Dynamics: Theory Research and Practice*, 6(1), 101–115.
- Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2005). Understanding and using the implicit association test: II. Method variables and construct validity. *Personality and Social Psychology Bulletin*, 31(2), 166–180.
- Owen, D. (2000). Taking humor seriously — George Meyer, the funniest man behind the funniest show on TV. *New Yorker*, March 13; 13–37.
- Owren, M. J., & Bachorowski, J. A. (2001). Smiling, laughter, and cooperative relationships: An attempt to account for human expressions of positive emotions based on “selfish gene” evolution. In T. Mayne, & G. A. Bonanno (Eds.), *Emotion: Current issues and future development* (pp. 152–191). New York: Guilford.
- Pinker, S. (1997). *How the Mind Works*. New York: W.W. Norton.
- Platow, M. J., Haslam, A., Both, A., Chew, I., Cuddon, M., Goharpey, N., Maurer, J., Rosini, S., Tsekouras, A., & Grace, D. M. (2005). ‘It’s not funny if they’re laughing’: Self-categorization, social influence, and responses to canned laughter. *Journal of Experimental Social Psychology*, 41(5), 542–550.
- Provine, R. R. (1996). Laughter. *American Scientist*, 84, 38–45.
- Provine, R. R. (2000). *Laughter: A scientific investigation*. New York: Viking.
- Provine, R. R., & Fischer, K. R. (1989). Laughing, smiling and talking: Relation to sleeping and social contexts in humans. *Ethology*, 83, 295–305.
- Ramachandran, V. S. (1996). The evolutionary biology of self-deception, laughter, dreaming and depression: Some clues from anosognosia. *Medical Hypotheses*, 47, 347–362.
- Reysen, S. (2005). Construction of a new scale: The Reysen Likeability Scale. *Social Behavior and Personality*, 33, 201–208.
- Shammi, P., & Stuss, D. (1999). Humour appreciation: A role of the right frontal lobe. *Brain*, 122, 657–666.
- Sprecher, S., & Regan, P. (2002). Liking some things (in some people) more than others: Partner preferences in romantic relationships and friendships. *Journal of Social and Personal Relationships*, 19, 463–481.
- Stillman, T. F., Baumeister, R. F., & DeWall, C. N. (2007). Does controlling money make you seem funny? Effects of power on laughter. *Personality and Social Psychology Bulletin*, 33, 1547–1558.
- Weisfield, G. E. (1993). The adaptive value of human laughter. *Ethology and Sociobiology*, 14, 141–169.