Laughing, Tickling, and the Evolution of Speech and Self

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ABSTRACT—*Laughter is an instinctive, contagious, stereotyped, unconsciously controlled, social play vocalization that is unusual in solitary settings. Laughter punctuates speech and is not typically humor related, speakers often laugh more often than their audience, and male speakers are the best laugh getters. Laughter evolved from the labored breathing of physical play, with the characteristic "pant-pant" laugh of chimpanzees and derivative "ha-ha" of humans signaling ("ritualizing") its rowdy origin. Laughter reveals that breath control is why humans can speak and chimpanzees cannot. The evolution of bipedality in human ancestors freed the thorax of its support role in quadrupedal locomotion, a critical step in uncoupling breathing from running, providing humans with the flexible breath control necessary for speech and our characteristic laugh. Tickle, an ancient laughter stimulus, is a means of communication between preverbal infants and mothers, and between friends, family, and lovers. Because you cannot tickle yourself, tickle involves a neurological self/nonself discrimination, providing the most primitive social scenario.*

KEYWORDS—*laughter; tickle; speech origins; bipedalism; self-perception*

Among friends, we voice our instinctive social call of "ha-ha-ha," a sound more like the cries and songs of wild animals than like human speech (Provine & Yong, 1991). And when we hear laughter, we often bark back "ha-ha-ha," joining fellow *Homo sapiens* in a chorus of contagious laughter (Provine, 1992). The strangeness of this call and response is masked by its familiarity. Laughter reveals us as a social mammal, stripping away our veneer of culture and language, challenging the shaky hypothesis that we are rational creatures in full conscious control of our behavior. Given the social and emotional potency of the utterance, our ignorance of laughter is remarkable. Like love, laughter has hovered at the threshold of scientific scrutiny. And when scientists have turned their attention to laughter, it has been most often directed to the related issues of humor, personality, health benefits, or social theory, not laughter itself. Recent studies establish laughter as a worthy topic for scientific inquiry and a powerful tool for exploring a variety of neurobehavioral topics, from speech origins to the evolution of self (Provine, 2000).

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LAUGHTER: WHO, WHEN, AND WHY?

In the spirit of Jane Goodall studying chimpanzees in the forest, three undergraduate students and I examined the social context of laughter by surreptitiously observing 1,200 instances of spontaneous laughter of humans in their natural settings, ranging from suburban shopping malls to a university student union (Provine, 1993). For each instance of laughter, the following data were recorded: the gender of the *speaker* (the person speaking immediately before laughter occurred) and of the *audience* (the person listening to the speaker), whether the speaker and the audience laughed, and what the speaker said immediately before the laughter. These simple methods provided surprising results. Whereas we often think of laughter as an audience reaction to a humorous comment by a speaker, the scenario of stand-up comedy, the speakers in this study laughed an average of 46% more than their audience, and only 10 to 15% of prelaugh comments were remotely humorous. Banal comments like "Where have you been" or "It was nice meeting you, too" were the typical fare. Most prelaugh dialogue is like that of an interminable television situation comedy scripted by an extremely ungifted writer.

The necessary stimulus for laughter is not a joke, but another person. Evidence that laughter is a social vocalization came from students in my classes who recorded the circumstances of their laughter in diaries for 1 week (Provine & Fischer, 1989). After the vicarious social stimuli of media (television, radio, books, etc.) were excluded, laughter's social nature was striking. Laughter was 30 times more frequent in social than solitary situations. When alone, the students were much more likely to talk to themselves or even smile than to laugh. However happy we may feel, laughter is a signal we send to others, and it is rare

when we lack an audience, a finding consistent with growing evidence of *audience effects* in emotional expression (Russell & Fernandez-Dols, 1997). If you want more laughter in your life, seek out friends instead of a comedy video, or if you desire some comic relief, view the video with friends.

There are substantial gender differences in laughter patterns. In 1,200 cases of laughter (Provine, 1993), both sexes laughed a lot, but in cross-gender conversations, females laughed 126% more than their male counterparts, meaning that women do most of the laughing, whereas males tend to do the most laugh getting. Think back to your high school class clown—most likely a male. This pattern of female laughing and male laugh provoking appears at 5 to 6 years of age, when joking first develops, and exists in all cultures that have been observed.

Male and female laugh patterns suggest that laughter may be a factor in meeting, matching, and mating. Among young German adults, Grammer and Eibl-Eibesfeldt (1990) observed that the more a woman laughed during an encounter, the greater was her self-reported interest in the man to whom she was talking. In the same vein, men were most interested in women who laughed in their presence. The laughter of the female, not the male, is most predictive of a promising relationship. But not all laughter is equally effective. Bachorowski and Owren (2001) found that voiced laughs make a more positive impression than unvoiced grunts or pants. In an analysis of 3,745 personal ads from eight major U.S. newspapers (Provine, 2000), females were more likely than males to indicate they were seeking a "sense of humor," whereas men were more likely to offer it. However, women seeking men with a "good sense of humor" are probably looking not for giggly guys, but rather for men who make them laugh, perhaps dominant males. At your next social gathering, observe laugh patterns. Females laugh most in the presence of men whom they find attractive or interesting.

These laughter patterns are particularly revealing because laughter is spontaneous and relatively uncensored, thus showing our true feelings. Laughter, like crying, is difficult to produce on command and, therefore, is an honest signal. We cannot deliberately activate the brain's mechanism for affective expression—laughter is an unplanned response to social, cognitive, and linguistic cues. It follows that we should be skeptical of people's post hoc reports of why they laughed (e.g., "I was nervous," "I felt happy," "Someone did something funny"). Lawful social contingencies need not require conscious control. The literature of laughter and humor often neglects this fact, thus committing an *error of intentionality* (Provine, 2000), falsely assuming that laughter is a choice and under strong voluntary control.

LAUGHTER PUNCTUATES SPEECH

During conversation, laughter by speakers usually follows complete statements or questions. It is not randomly scattered throughout the speech stream. Thus, a speaker may say, "You are going where?—ha-ha," but rarely "You are going—ha-ha—where?" Placing laughter in the speech stream is akin to punctuating written communication and is termed the *punctuation effect* (Provine, 1993). The neurological processes that produce laughter and speech compete for a single vocal mechanism. Laughter seldom disrupts the phrase structure of speech, indicating that speech is dominant and has priority access to the vocal apparatus. The punctuation effect also holds for the audience, who has no comparable vocal constraint and could laugh at any time. The temporal segregation of laughter and speech in conversation suggests that the two vocalizations are governed by different brain mechanisms—laughing is not a matter of speaking "ha-ha." Laugh-speak, a curious hybrid in which you speak in a laughing manner, is more nuanced, is under more conscious control, and probably involves different brain mechanisms than the discrete "ha-ha" laugh considered here. (Laugh-speak is used by interviewers and others who wish to soften the impact of emotionally charged questions.) Punctuation effects are not unique to laughter—coughing, breathing, and other airway maneuvers seldom break phrases.

CHIMPANZEE LAUGHTER, BIPEDALISM, AND THE EVOLUTION OF SPEECH

Contrary to popular opinion, laughter is not unique to humans (Provine, 2000), and related play vocalizations are produced by other mammals (Panksepp & Burgdorf, 1999). Chimpanzees and other great apes also produce a laughlike sound when tickled or during play, a fact noted by Darwin in *The Expression of Emotions in Man and Animals* (1872/1965). However, the ape "laughing" and "chuckling" reported by Darwin, Goodall, Fossey, and others is actually a breathy panting that can escalate to more guttural "ah-grunting," if intense. This ape laughter mimics the labored breathing of vigorous play but signals playful intent, not physical exertion. There is nothing arbitrary about the sound of laughter in humans and great apes. Laughter is the sound of play, whether it be the primal chimpanzee "pant-pant" or the derivative human "ha-ha" (Provine, 2000).

In important details, chimp laughter differs from that of humans, and this difference reveals why we can talk and other apes cannot. Laughing humans chop an outward breath into a series of short (1/15 s), vocal blasts ("ha-ha," etc.) that repeat about every 1/5 s (Provine & Yong, 1991). In contrast, laughing chimpanzees do not parse their exhalations, but produce one laugh sound per outward and inward breath (Provine, 1996).

Laughter reveals a critical constraint on the evolution of speech in nonhuman primates (Provine, 1996, 2000). After all, how much vocal facility is available to animals, such as chimpanzees, who are limited to only one or a few syllables per breath? Chimpanzee vocalization is captive to an inflexible neuromuscular system that is closely tied to the ancient and essential labor of breathing. Although not obligate quadrupeds, chimpanzees share constraints typical of other four-legged animals, whose breathing and running are closely synchronized

(one stride per breath) to brace the thorax for forelimb impacts. Without inflated lungs, the thorax is a floppy, air-filled bag, the reason you hold your breath and grunt to push or lift a heavy weight. Respiratory constraints are at least as critical to the emergence of speech as the more traditionally studied structures of the tongue, larynx, and vocal tract. Ultimately, vocalizing requires the cessation of breathing and redirection of the respiratory apparatus in the service of sound making.

The evolution of bipedalism permitted flexibility in the coordination of breathing, running, and vocalizing. This is the basis of the bipedal ("walkie-talkie") theory of speech evolution (Provine, 2000). A bipedal human runner, for example, may employ a variety of strides per breath: The ratio can be 4:1, 3:1, 5:2, 2:1, 3:2, or 1:1, with 2:1 being the most common (Bramble & Currier, 1983). Freed of the necessarily rigid 1:1 link between stride and breath characteristic of quadrupeds, our early ancestors evolved a vocal system in which individual sounds were no longer tied to single breaths, permitting the subsequent natural selection for speech and, incidentally, our species' characteristic "ha-ha" laugh.

TICKLE, SOCIAL PLAY, AND THE EVOLUTION OF SELF

Tickling may be the most reliable and ancient stimulus of laughter (Provine, 2000). Tickling also may be the source of the most ancient joke, the feigned tickle of the "I'm going to get you" game, a playful ruse that works well with both human babies and chimpanzees. The neurological mechanism of tickling probably evolved from a reflex defense mechanism that protects our body's surface from external, moving stimuli, probably predators or parasites. Our response to tickle is more varied and complex than the typical reflex, but it has some stereotypic, reflex-like properties (i.e., we laugh when tickled, struggle to escape the tickler, huddle, fend off the tickling hand). Although you can be tickled to laughter by a machine (Harris, 1999), most everyday tickle is yet another social context for laughter and a form of communication. Solo tickle is even emptier than solo sex—you can masturbate to climax but you cannot tickle yourself. A survey of 421 males and females between 8 and 86 years of age indicated that people tickle and are tickled overwhelmingly by friends, family, and lovers (Provine, 2000). Have you ever tickled or been tickled by a total stranger? The most commonly given rationale for tickling someone is "to show affection," followed by "to get attention," motives consistent with the close social relationships between ticklers and ticklees. Nonconsensual tickle is as unwelcome as nonconsensual sex.

Tickle battles, the most benign form of human conflict, bind us together in a laugh-filled give-and-take that may be the basis of all social play. Reciprocity is an important element of tickle play. Consider the social choreography of tickle. The ticklee may push away the offending hand of the tickler and escape, only to return, renew the interaction, and counterattack. For infants who cannot yet talk, being tickled, along with the associated laughter, is an entrée into social relationships with caregivers. Laughter signals "I like it; do it again!" Crying and fending off the other person signals the game has gone too far. In adults, the tactile friskiness and reciprocity of tickle becomes a part of sex play. From adolescence onward, you are about 7 times more likely to be tickled by someone of the opposite sex than by someone of the same sex. It is notable that the frequency of tickle frolics declines precipitously (about 10-fold!) after the age of 40, probably because fewer potential ticklees are available after children have grown up and left the home, and because of a reduced sex drive. Tickle's last hurrah may be in the physical play of grandparents with grandchildren.

Tickle also provides a novel approach to *self*, one's sense of personhood, moving debate about its origin from personality theory to neural mechanism (Provine, 2000). This approach begins with the observation that you cannot tickle yourself—tickle requires a *nonself*, animate entity on the surface of your skin. (A nonself, animate *other* is the most primitive level of social stimulus.) Self-produced cutaneous stimuli are not ticklish because our nervous system cancels their ticklish effects, perhaps in the cerebellum, a hindbrain structure usually associated with coordinating movement (Blakemore, Wolpert, & Frith, 1998). In the absence of such cancellation, we would be constantly tickling ourselves by accident—the world would be filled with goosey people lurching their way through life in a chain reaction of tactile false alarms. The same mechanism that detects nonself, ticklish stimuli may generate the sense of self (Provine, 2000). Although our sense of identity involves more than self/nonself discrimination, such a mechanism may be at the foundation of a sense of identity and a first step toward the evolution of personhood and the neurological computation of its boundaries. Pathology of the self/nonself discriminator may play a role in abnormal social behavior (e.g., touch aversion in autism) and body perception (e.g., neglect, the denial of ownership of a part of one's body). The computation of *other* also provides a bridge linking the often estranged disciplines of social psychology and neuroscience.

FUTURE DIRECTIONS

The frontiers of laughter research are near; the opportunities are vast and can be exploited with simple tools (Provine, 2000). Tactically, laughter's stereotypy and elemental structure relative to speech offer an inviting and easily implemented approach to human vocal production and perception of the sort usually associated with the simpler animal models of birdsong or animal cries. You can study human primates and forget about cleaning those messy animal cages. I close by mentioning selected research themes emerging from this discussion of laughter.

The contagiousness of laughter, the tendency to laugh in response to perceived laughter, suggests that we evolved a brain laughter detector that, when activated, replicates the vocalization that produced it. Whatever its mechanism, the contagion of

laughter, like the contagion of yawning, has a strong genetic basis and is a novel starting point for studies in diverse areas ranging from social neuroscience and speech perception to human group behavior.

Laughter is stereotyped, but not invariant. Research is needed to define its sonic variability in different social, emotional, and linguistic contexts. Such baseline data will refine and expand the presently crude diagnostic measures of abnormal and inappropriate laughter and reveal new classes of inappropriate affect, a leading symptom of psychopathology.

Your inability to tickle yourself suggests neurologically based definitions of self and other. Developing a similar machine algorithm may lead to "ticklish" robots whose performance is enhanced by their capacity to distinguish touching from being touched, and, provocatively, may provide a computationally based construct of machine personhood.

Recommended Reading

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