

Emotions and Health: Laughter Really Is Good Medicine

By Jacob Schor, ND, FABNO

That laughter could be used as a medical therapeutic intervention was highly popularized by the story of Norman Cousins, initially published as a case history in *JAMA* and then later as a biographical book, *Anatomy of an Illness*.¹ Cousins, editor of the *Saturday Review* and one of America's best known intellectuals, treated his own his own ankylosing spondylitis using Marx Brothers–induced laughter; his public advocacy for the benefit of laughter was widely noticed. His writing inspired medical researchers in different parts of the world to conduct numerous experiments measuring the physiologic effects and benefits of laughter, some of which will be reviewed in this paper. Though Cousins found watching Marx Brothers movies to be his preferred panacea, Harpo and company are not the research standard for eliciting laughter.

Chaplin and Bean

Over the past decade a fascinating series of lectures has been published by Hajime Kimata, an allergist at Unitika Central Hospital in Uji-City, Japan. I refer to them as the Chaplin Studies. In almost all of these studies, Kimata has had study participants view Charlie Chaplin's 1936 movie *Modern Times* as a therapeutic intervention. More recently he has occasionally substituted movies using Mr. Bean.

The first mention Kimata made of this therapeutic intervention was in a letter to *JAMA* in 2001. He gives credit in the letter to Norman Cousins for giving him the idea for his research.

In his first trial, Kimata studied 26 patients with atopic dermatitis who were all allergic to dust mites; most were also allergic to cedar pollen and cat dander. After going 72 hours with no medication, the participants underwent skin prick tests before and after viewing *Modern Times*. The size of the resulting wheal was measured. A similar procedure was repeated before and after an 87-minute video featuring weather information. The wheal responses to dust mites, cedar pollen, and cat dander were significantly reduced after watching Chaplin and the effect lasted for hours. Watching the weather had no effect on the wheal size.²

Kimata has experimented with stimuli other than funny movies over the years. In 2003 he reported on the effects of music written by two different classical composers. In this study he chose patients who were allergic to latex rather than dust mites. A positive response was seen in patients who listened to Mozart music, but interestingly, no response was seen in patients who listened to Beethoven.³

Beethoven may have no impact on allergic responses, but playing violent video games or just hearing cell phones ringing clearly worsens symptoms, according to two separate studies. In the video game study, 25 normal subjects, 25 patients with allergic rhinitis, and 25 with atopic eczema/dermatitis syndrome played the video game, *Street Fighter II*, for 2 hours. Playing the video game had no effect on either the healthy subjects or the patients with allergic rhinitis. "In contrast, playing video

games significantly enhanced allergen-induced skin wheal responses and increased plasma levels of substance P, vasoactive intestinal peptide, and nerve growth factors in the patients with atopic eczema/dermatitis syndrome," the report states.

In the mobile phone study, 27 normal subjects, 27 patients with allergic rhinitis, and 27 with atopic eczema/dermatitis syndrome, were exposed to 30 incidences of ringing mobile phones over a period of 30 minutes. Again the healthy patients and those with allergic rhinitis were unaffected, but those with atopic eczema experienced a worsening of symptoms.⁴

A 2004 paper in the journal *Human Behavior* again included cell phones in a study on dermatitis. This study compared the effect on specific blood parameters in people with atopic dermatitis of watching Rowan Atkinson's *The Best Bits of Mr. Bean*, viewing weather information, or writing text messages on a cell phone. Watching Mr. Bean reduced all measures of allergic response, while watching weather information did not. Text messaging on a mobile phone enhanced measures of allergic response. "However, previewing the comic video counteracted mobile phone–mediated enhancement of plasma neurotrophins or allergic skin wheal responses, whereas previewing the weather information failed to do so."⁵ The thought that we need Mr. Bean as an antidote to the stress of living with a cell phone is, in itself, humorous.

In a 2004 paper, Kimata compared watching a humorous or non-humorous film on patients with bronchial asthma and their reaction to known triggers. As expected, watching the funny movie reduced the asthmatic reactions, while the non-funny movie had no effect.⁶ In a separate study, Kimata demonstrated that laughter decreases production of IgE specific to allergens.⁷

It should be noted that Kimata's work on asthma appears to contradict an earlier 2003 Australian study that indicated that hard laughter was a common trigger for asthma attacks in children.⁸ The same author reported a year later that 42% of the 105 patients surveyed reported mirth triggered asthma.⁹ The earlier study reported significant decreases in peak expiratory flow while watching humorous movies. These same people were also sensitive to exercise which would trigger asthmatic reactions; laughter in these cases may be provoking exertional asthma.

In contrast, laughter appears to be useful in controlling allergic asthma. Before and after trials using known allergic challenges show that watching humorous movies changes bronchial responsiveness for the better.¹⁰

However, it is not all fun and games when treating skin conditions. Crying can also be useful. Rather than Chaplin, in a 2006 paper, Kimata reports having patients with latex allergies watch the 1979 family-breakup drama *Kramer vs. Kramer*. Those patients who were moved to tears had a reduced allergic response.¹¹ Perhaps any strong emotional response is useful for treating allergies.

In a 2007 paper, Kimata reports that humorous films are useful in treating nighttime waking in children with atopic dermatitis and that this benefit may be due in part to lowering ghrelin levels. Patients, especially children, with atopic dermatitis often suffer from nighttime waking, an association that may be mediated by ghrelin. Ghrelin is a hormone produced in the digestive tract, mainly in the stomach and pancreas, that stimulates hunger. It balances the effect of the hormone leptin produced in fat tissue that produces a sensation of satiety after eating.¹² Kimata measured salivary ghrelin levels during the night in 40 healthy children and 40 patients suffering from atopic dermatitis with nighttime waking. Salivary ghrelin levels at 2 AM were markedly elevated in patients with atopic dermatitis compared to those in healthy children. In contrast, viewing humorous films before bedtime improved nighttime waking and lowered salivary ghrelin levels in the kids with atopic dermatitis.¹³

Another theory to explain this nighttime waking has to do with melatonin. Kimata published a study about nursing mothers in 2007. This paper also focused on why kids with atopic eczema don't sleep well, but this time he monitored melatonin levels. Watching Charlie Chaplin increased production of melatonin in women, whether they had atopic dermatitis or not, and also increased melatonin in their breast milk. The study found that, "feeding infants with increased levels of melatonin-containing milk reduced allergic responses in infants."¹⁴

One can even measure a change in eczema-related chemicals in the sweat of people who've watched *Modern Times*. Dermcidin (DCD)-derived peptide is an antimicrobial protein produced by the sweat glands. People with atopic eczema have lower levels of DCD-derived peptide in their sweat. In this study, researchers measured the levels of this DCD protein in the sweat of 20 people before and after watching *Modern Times*. Watching the movie increased the levels of this specific protein and may be part of the reason it helped their skin.¹⁵

In a study of older men watching Mr. Bean, Kimata measured salivary testosterone levels and transepidermal water loss (TEWL) values on the back of the neck in 36 elderly healthy men and 36 elderly men with atopic dermatitis. This TEWL measurement of water loss is basically a measurement of how easily the skin dries out. Salivary testosterone levels were decreased, while TEWL values were increased in elderly patients with atopic dermatitis compared to those in the healthy elderly group. Viewing *The Best Bits of Mr. Bean* slightly elevated salivary testosterone levels and reduced TEWL values in healthy elderly men. In the elderly men with dermatitis, however, viewing the Bean film markedly elevated salivary testosterone levels and reduced TEWL. Viewing a control non-humorous film failed to change values in either the healthy or dermatitis groups. Not only is watching funny movies useful for atopic dermatitis, but it may be useful simply for treating dry skin in elderly people.¹⁶

In an early 2009 paper, Kimata has decided to return to viewing *Modern Times*, demonstrating the benefit of his therapy in treating gynecological allergic reactions. After viewing this Chaplin movie, patients had a significant decrease in IgE production by seminal B cells as an allergic response to sperm cells.¹⁷

These studies raise the question of whether cultural changes are affecting susceptible individuals who are prone to atopic dermatitis. One might joke that the increased time spent watching the weather channel instead of humorous sitcoms is increasing incidence of atopic dermatitis. Ringing cell phones, text messaging, and video games have become commonplace in daily life. Could the increased prevalence of these factors that are known to aggravate atopic dermatitis be increasing incidence of atopic dermatitis?

Incidence of atopic dermatitis in children has increased in recent years.¹⁸ Between 1997 and 2004 the number of yearly pediatric office held even, but the percentage of those visits that were for atopic dermatitis increased significantly. In 1997 there were an estimated 620,000 pediatric visits for atopic dermatitis; by 2003, the number increased to 1.7 million. Certainly these trends are not proof that cell phones or video games cause eczema, but it is interesting to observe the correlation.

National Public Radio recently aired a lighthearted vignette about Ashok Aswani (<http://www.npr.org/templates/story/story.php?storyId=113029425&ft=1&f=1004>), a doctor in India who hands out DVDs of Charlie Chaplin movies to his patients as medicine.

Dr. Aswani apparently wears a Chaplin costume in his office. On one hand this may sound a bit unprofessional; on the other, his intervention may prove to be as efficacious as the standard steroid treatments with little concern for costs and almost no worry over side effects. The concept is anything but funny when you consider the advantages of his intervention.

This information suggests certain situations in which we might prescribe Chaplin or Bean. Consider as a candidate the nursing mom whose baby has atopic dermatitis and night waking. These data alone provide us a therapeutic rationale for interrupting our patient visits to tell a joke now and then. Based on the research, laughter is good for more than clearing up a bit of insomnia and eczema and can be achieved through a variety of creative means.

Clowning Around

A 2005 paper in *Pediatrics* reports that having a clown present in the surgery room while the anesthesia is administered significantly reduces anxiety in children.¹⁹ A 2008 paper suggests that watching clowns perform a bit earlier, before surgery, greatly reduces anxiety levels in kids. This reduction in anxiety endures and is still measurable for a full week after the surgery.²⁰

It's not just kids who are getting the clown treatment; clowns are working in geriatrics as well. A 2007 pilot project in Germany in which clowns came in to geriatric wards once a week found enough improvement in patient attitudes to provide, "sufficient reason to initiate similar projects in the future."²¹

Psychiatric wards are also seeing clowns. A 2006 report by psychiatrists working with schizophrenic patients in Natanya, Israel, reports on a 3-month marathon of movie watching. Twenty-nine psychiatric inpatients viewed humorous movies daily for 3 months. This reduced their levels of psychopathology: fewer anger, anxiety, and depression symptoms and improved social competence were seen on testing.²² These same researchers had conducted almost the exact same experiment more than a decade earlier; 34 patients, 70 movies in 3 months. In the earlier experiment they weren't sure whether the psychological assessments were accurate. The staff had watched the same movies along with the patients, and the incidental exposure may have left them in better moods, more likely to give patients more positive assessments.²³

The research on clowns in medicine is limited, and searching for more research on clowns becomes frustrating. The automatic spelling corrector on PubMed changes "clown" to "crown" and yields papers from dental journals. However, despite limited evidence, clowning is applied to medicine in various examples, as famously embodied by the work of Patch Adams. Also, the international non-governmental agency Clowns Without Borders sends volunteer clowns internationally to aid in areas of tragedy.

A 2006 paper compared the effects of a 1-hour humor therapy session at 2-week intervals on patients suffering from either depression or Alzheimer's disease. The therapy proved beneficial for the depressed patients but showed no benefit for those with Alzheimer's disease.²⁴ This could be a lead up to a joke as the obvious explanation for these results is that depressed people tend to dwell on things. In this case they probably retold the jokes over and over in their heads, while those with Alzheimer's promptly forgot the punch lines.

Neurologic, Immune, and Endocrine Effects

The connection between stress and immunity is well established, and the potential role of therapeutic laughter has received some attention. As early as 1989, Berk and colleagues reported that laughter reduced biochemical markers of stress, such as serum cortisol.²⁵ Berk later

reported that viewing a single humorous movie increased immune parameters, such as natural killer (NK) cell activity.²⁶ In a similar series of studies, Bennett and colleagues reported that a single movie lowered stress self-assessments and increased NK cell activity.^{27,28}

Japanese researchers tell us in a 2005 paper that “mirth therapy” affects inflammatory cytokine levels in rheumatoid arthritis patients. The test subjects listened to a Rakugo performance to induce mirthful laughter. Rakugo is a traditional Japanese performance art in which a lone performer seated onstage performs a highly stylized humorous monologue. Chemical markers of inflammation changed with Rakugo-induced laughter, but interestingly the effects varied depending on the severity of disease.²⁹

Studies in 2001 and 2003 report that viewing a single “mirthful movie” lowered stress self-assessments in people who watched it, and these people showed significantly increased NK cell activity.^{30,31}

Laughter’s effect on NK cells is also seen in studies with diabetic patients. Hayashi and colleagues have published a series of recent papers on laughter’s effect and potential in treating diabetes that demonstrate remarkable findings, not just for this specific disease but in elucidating the connection between emotion and changes in gene activity on the cellular level. In 2006, they reported on measurable changes in gene expression in patients with type 2 diabetes who had been induced to laugh. Starting with the simple premise that, “positive emotions influence endocrinological and immunological response,” the researchers performed an elegant experiment. They measured the changes in gene expression triggered by laughter. They analyzed the changes in 18,716 genes finding that 23 were significantly changed after listening to a comic story compared to a boring lecture. Eight were relatively up-regulated and 15 were down-regulated an hour and a half after the laughing episode. Of the genes changed, 4 were involved in immune response and were down-regulated. Of the up-regulated genes, 5 of the 8 were related to the cell cycle, apoptosis, and cell adhesion. None of the genes were directly involved in blood glucose metabolism.³²

Hayashi and his group published a second paper in 2007 following up on their first one.

They recruited participants with type 2 diabetes who were attending a seminar on managing diabetes. On one day of the experiment the patients watched a comic video; on the second day, they attended a diabetes education program. Blood samples were collected before and after both the funny video and the seminar lecture. This time 41,000 genes were analyzed and the laughter experience up-regulated 39 genes, 27 of which stayed up-regulated for the duration of the experiment. Of these, 14 genes were related to NK cell activity. As in the earlier study, none of the genes affected were directly involved in blood glucose regulation, yet participants had lower postprandial blood glucose levels after watching the comedy. Laughter improved postprandial blood glucose levels by modulating NK cell activity.³³

In the summer of 2009, Hayashi’s group published another study, again looking at how laughter affects gene expression in diabetic patients, but this time he also monitored additional physiologic changes that result. Laughter again lowered 2-hour postprandial blood sugar levels in type 2 diabetics and left changes in gene expression. In this paper Hayashi reports that laughter decreased the levels of prorenin in blood; prorenin is involved in the onset of diabetic complications. Laughter also normalized the expression of the prorenin receptor gene on peripheral blood leukocytes, which is reduced in diabetic patients. These findings suggest that laughter may inhibit the onset or advancement of diabetic complications starting at the level of gene-expression. They again showed that laughter affected specific genes that mediate NK cell activity and this produced improvement in glucose levels.³⁴

These are not the first papers to suggest laughter could prevent diabetic complications; Nasir and colleagues had measured and reported changes in the rennin-angiotensin system as early as 2005. They measured the effect of laughter therapy on rennin angioten-

sinogen and prorenin levels in the plasma of type 2 diabetics over a 6-month period in which the patients engaged in laughter therapy. The rennin concentrations fell rapidly, dropping from 24.6 ng/ml/h to 8.2 ng/ml/h after 3 months and then down to 7.7 after another 3 months of therapy. Plasma angiotensinogen more than doubled from 0.19 to 0.47 and then 0.42 mcg/ml, at 3- and 6-month tests. Plasma prorenin concentrations dropped slightly over the 6 months of laughter therapy, starting at 195.1 pg/ml and ending at 170.7 pg/ml. Based on these findings, the authors suggested that laughter therapy might be used to prevent diabetic complications.³⁵

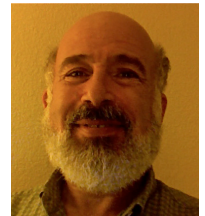
In 2005 Christie and Moore reviewed the laughter research to determine the impact humor has on cancer patients for the *Clinical Journal of Oncology Nursing*. They found 20 pertinent studies in the medical literature that identified several key effects; the most consistent finding was that humor improved pain thresholds, reducing discomfort. The studies also showed the potential of laughter and humor to lower anxiety and discomfort and increase NK cell activity, all effects that seem desirable in this patient population.³⁶

In summary, the scientific literature demonstrates that the effects of humor and laughter on health are far-ranging and numerous. Kimata’s work demonstrates that laughter can play a significant role in ameliorating atopic eczema and dermatitis. Hayashi’s work suggests that laughter immediately causes changes in genetic expression, favoring increased NK cell activity and having favorable effect in diabetes. In simple words, laughter provides an antidote to stress.

Although the practice of medicine is a serious task, we should keep in mind that humor is a potentially useful therapeutic tool. By example and by prescription we can and should teach our patients to use laughter and humor as a therapeutic intervention. We should remind our patients that they need to partake in this antidote regularly; we should also remind ourselves.

About the Author

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