NARRATIVE REVIEW

THE THERAPEUTIC VALUE OF LAUGHTER IN MEDICINE

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Objective • The aim of this review is to identify, critically evaluate, and summarize the laughter literature across a number of fields related to medicine and health care to assess to what extent laughter health-related benefits are currently supported by empirical evidence.

Data Sources and Study Selection • A comprehensive laughter literature search was performed. A thorough search of the gray literature was also undertaken. A list of inclusion and exclusion criteria was identified.

Data Extraction • It was necessary to distinguish between humor and laughter to assess health-related outcomes elicited by laughter only.

Data Synthesis • Thematic analysis was applied to summarize laughter health-related outcomes, relationships, and general robustness.

Conclusions: Laughter has shown physiological, psychological, social, spiritual, and quality-of-life benefits. Adverse effects are very limited, and laughter is practically lacking in contraindications. Therapeutic efficacy of laughter is mainly derived from spontaneous laughter (triggered by external stimuli or positive emotions) and self-induced laughter (triggered by oneself at will), both occurring with or without humor. The brain is not able to distinguish between these types; therefore, it is assumed that similar benefits may be achieved with one or the other. Although there is not enough data to demonstrate that laughter is an all-around healing agent, this review concludes that there exists sufficient evidence to suggest that laughter has some positive, quantifiable effects on certain aspects of health. In this era of evidence-based medicine, it would be appropriate for laughter to be used as a complementary/alternative medicine in the prevention and treatment of illnesses, although further well-designed research is warranted. (*Altern Ther Health Med.* 2010;16(6):56-64.)

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That laughter has health benefits has been claimed for centuries; however, during the past decades, several laughter- and humor-based interventions have gained widespread acceptance, and scientific studies of this phenomenon have generated considerable medical and public interest. In 1976, Norman Cousins published the article "Anatomy of an Illness" in *The New England Journal of Medicine*, in which he explained that 10 minutes of genuine belly laughter as a result of viewing comic films had a considerable analgesic effect and gave him at least 2 hours of sleep free from the pain of ankylosing spondylitis.[1] It was never clear whether his pain relief was due to the laughter or to the massive dose of vitamin C administered simultaneously, but the case became famous and encouraged scientists to investigate and define how laughter may heal, founding the basics of current "laughter medicine."

Though it takes skill and time to develop the science and art of what makes a person laugh and to ascertain the related benefits, laughter therapy does not require large amounts of time or money to be applied. Unlike other therapies that are more time-consuming or expensive, the use of laughter can be implemented easily and cost-effectively in patient care.[2,3] Nevertheless, there are now so-called "laughter trainers" and accounts all over the popular media proclaiming the supposed physical, psychological, emotional, social, occupational, spiritual, and quality-of-life benefits of laughter. Scientific data for these claims must be well documented before evidence-based "laughter medicine" can be widely supported by the health care community.[4-9]

The aim of this review is to identify, critically evaluate, and summarize the laughter literature across a number of fields related to health, health care, patient care, and medicine with the purpose of assessing to what extent laughter health-related benefits are currently supported by empirical evidence.

METHODS

Definitions

This review focuses on the health-related effects of laughter only. One of the most significant methodological problems in laughter research is the failure to distinguish humor from laughter. A full discussion on laughter and humor theories is beyond the scope of this review, but a few basic definitions are essential.[6] For the purpose of this review, *humor* is defined as one of the stimuli that can help people laugh and feel happy. *Sense of humor* is a psychological trait that varies considerably and allows people to respond to different types of humorous stimuli. And *laughter*

is defined as a psychophysiological response[10,11] to either humor or any other stimuli with the following characteristics[12]: (1) powerful contractions of the diaphragm together with repetitive vocal sounds produced by the action of the resonating chambers of the pharynx, mouth, and nasal cavities; (2) typical facial expression (motion of about 50 facial muscles, mainly around the mouth), which may include the release of tears; (3) motion of several groups of muscles of the body (more than 300 may be distinct); and (4) a sequence of associated neurophysiological processes (cardiovascular and respiratory changes, activation of neuroendocrine and immune circuits). Internally, laughter comes with positive psychological shifts and a subjective identifiable emotion (hilarity) that has been compared to the one coming from sexual activity or other joyful bodily responses.

It is apparent that humor and laughter are distinct events (although often associated). Whereas humor is a stimulus and can occur without laughter, laughter is a response and can occur without humor.[13] It is necessary to distinguish between these variables, as many analyses of humor have used a humor stimulus (such as a comic movie) to determine the effect of "humor" on a health-related outcome, and others look specifically at the effects of laughter on these outcomes. Still others explore different ways to assess sense of humor in an attempt to analyze whether scoring higher on a sense-of-humor scale is associated with certain health outcomes.

Design

A systematic review was conducted. This type of review is particularly useful where the aggregation of data is difficult because diverse definitions, many studies or fields, and different outcomes are being analyzed.[14] A comprehensive laughter and humor literature search was performed using a variety of databases and keywords. A manual search of relevant sources, a journal-specific search, and a manual search of references included in relevant retrieved articles also were included (Table 1). A thorough search of the gray literature also was undertaken (eg, Google). A list of inclusion and exclusion criteria was identified (Table 2). All relevant published articles up to 2008 were reviewed. No papers were excluded on the basis of quality because of the dearth of literature meeting the established inclusion or exclusion criteria. Thematic analysis was applied to summarize laughter and humor theories, health-related outcomes, patient outcomes, relationships, and general robustness.[15] This review was not funded.

TABLE 1 Databases, Journals, and Keywords Searched

Databases	Journals specific	Keywords
Cochrane Library	*Altern Ther Health Med*	Laughter (or laugh or laughing)
Medline	*BMC Complement*	Humor (not aqueous, not vitreous)
PubMed	*Altern Med*	Mirth (or mirthful)
SAGE Journals	*Complement Ther Clin Pract*	Therapy (or intervention)
Science Direct	*Complement Ther Med*	Complementary medicine
Internet (Google)	*Evid Based Complement Alternat Med*	Alternative medicine
	J Altern Complement Med	Holistic medicine
	J Psychosom Res	Integrative medicine
	Int J Humor Res	Mind-body Medicine
		Health (and health care)
		Patient (and patient care)

TABLE 2 Laughter Literature Search: Inclusion and Exclusion Criteria

Inclusion
Laughter or humor intervention main focus of paper
Direct or indirect relationship to health outcomes and medicine/therapy
Paper either research or seminal in some form
Literature review of >15 references (medicine texts only)
Exclusion
Humor stimulus or intervention not eliciting or measuring laughter
Brief items, anecdotes, cartoons, pictures, obituaries, commentaries, or interviews
Brief literature reviews based on ≤15 references (medicine texts only)
Semantics, linguistics, history (nontherapeutic research), eg, joke constructions, entertainment
Textbooks, media-related items, including health promotion
Non–health care occupation–related items
Non-English, non-Spanish language publications

RESULTS

The Effects of Laughter on Health Outcomes

The field of medicine is surprisingly less present in laughter research than would be expected. Its research is mainly dominated by the field of (medical) psychology across psychobiological, social, and health domains.

Mechanism of Action

In pursuing the therapeutic efficacy of laughter, four potential mechanisms of action have been established that would demonstrate its direct or indirect health benefits (humor-health connection).[4,8] First, laughter can lead to direct physiological changes to the muscular, cardiovascular, immune, and neuroendocrine systems, which would have immediate or long-term beneficial effects to the body.[16,17] Accordingly, laughter is crucial in this model and may be expected to have beneficial health outcomes even without humor, as advocated by the laughter club movement that originated in India in 1995.[18] The more you laugh, the more benefits you obtain. Secondly, laughter can lead to more positive emotional states, which also may have direct benefits to health or contribute to a personal perception of better health or quality of life.[19] Laughter is not that essential in this second model, as positive emotions may also be elicited by humor (without laughter), amusement, happiness, joy, love, and others. Here, the more playful approach to life, the more benefits. Third,

laughter can optimize one's own strategies for coping with stress and strengthen personal pain tolerance,[20] which may reduce the negative impact on health benefits that both can have. According to this stress-moderator model, which provides indirect effects, laughter during nonstressful times would be less relevant to health. Finally, laughter may indirectly increase one's social competencies, which as a result may increase interpersonal skills. In turn, the greater levels of social support gained may confer stress-buffering and health-enhancing benefits.[21,22] Laughter's role is here a lot less patent, as the main focus is on social skills. No other potential mechanisms of action for laughter have been reported as yet.

Therapeutic Efficacy

Although humor and laughter have been used therapeutically in a variety of medical and other conditions, well-designed randomized controlled trials (RCTs) have not been conducted to date validating the therapeutic efficacy of laughter, and only very few trials have been performed otherwise. However, health outcomes have been reported in multiple areas of medicine and patient care. This review has identified health-related laughter research, excluding pathological laughter, in the following areas: oncology[23-26]; allergy and dermatology[27,28]; immunology[29,30]; pulmonology[31-33]; cardiology, endocrinology, and metabolism[17,34-36]; internal medicine and rheumatology[37]; rehabilitation[38,39]; psychiatry and medical psychology[40-43]; anatomy, neurology, and imaging[44-50]; biophysics and acoustics[51-55]; geriatrics and aging[56-58]; pediatrics[59-61]; obstetrics[62]; surgery[63-65]; dentistry[66-68]; nursing[69-74]; critical, palliative, and terminal care[75-82]; hospice care[83-85]; home care[86]; general patient care and primary care[87-90]; epidemiology and public health[91,92]; complementary and alternative medicine (CAM)[93,94]; and medical and health sciences training.[95-97]

Physiological Benefits of Laughter

Humor, mirth, and laughter have numerous effects involving the muscular, cardiovascular, respiratory, endocrine, immune, and central nervous systems. The effects of laughter on certain physiological outcomes are briefly summarized in Table 3. The research reviewed in this area relates to the impact of laughter on the entire body and can be lumped into the following main physiological effects: laughter (1) exercises and relaxes muscles, (2) improves respiration, (3) stimulates circulation, (4) decreases stress hormones, (5) increases the immune system's defenses, (6) elevates pain threshold and tolerance, and (7) enhances mental functioning.

Psychological Benefits of Laughter

The psychological effects of humor and laughter relate primarily to both as a coping mechanism and, to a lesser extent, their enhancement of interpersonal relationships. Table 4 provides a brief overview of the effects of laughter on particular psychological outcomes. The research reviewed in this area, somehow larger and much stronger than the evidence for the physiological health benefits, can be summarized as follows: laughter (1) reduces stress, anxiety, and tension and counteracts symptoms of depression; (2) elevates mood, self-esteem, hope, energy, and vigor; (3) enhances memory, creative thinking, and problem solving; (4) improves interpersonal interaction, relationship, attraction, and closeness; (5) increases friendliness and helpfulness and builds group identity, solidarity, and cohesiveness; (6) promotes psychological well-being; (7) improves quality of life and patient care; and (8) intensifies mirth and is contagious.

Safety

The side effects of laugher are very limited. In specific cases, the appearance of a laughter-induced syncope has been reported.[167-170] Contraindications are nearly nonexistent; however, precaution is advised with patients who were recently released from surgery or who have certain cardiovascular or respiratory diseases or glaucoma.

Laughter Types and Health Benefits

Several kinds of laughter have been identified depending on various parameters and different fields of the scientific research.[171-173] From a medical and therapeutic point of view, five large groups can be summarized[12]: (1) genuine or spontaneous laughter, (2) self-induced simulated laughter, (3) stimulated laughter, (4) induced laughter, and (5) pathological laughter. Spontaneous laughter, unrelated to one's own free will, is triggered by different (external) stimuli and positive emotions (ie, happiness, mirth, joy, fun, triumph, humor, surprise, emotional release, or by contagion). It has been reported that spontaneous laughter causes typical contractions of the muscles around the eye socket (Duchenne laughter/smile[174]). Self-induced simulated laughter is triggered by oneself at will, with no specific reason (purposeful, unconditional) and therefore not elicited by humor, fun, other stimuli, or positive emotions. Stimulated laughter happens as a result of the physical (reflex) action of certain external factors (ie, to be ticklish, particular facial or bodily motions, by pressing laughter bones[175]). More superficial and empty-headed, induced laughter is the consequence of the effects of specific drugs or substances (ie, alcohol, caffeine, amphetamines, cannabis, lysergic acid diethylamide [LSD], nitrous oxide or "laughing gas," and others). Finally, pathological laughter is secondary to injuries to the central nervous system caused by various temporary or permanent neurological diseases and also may occur with certain psychiatric disorders. Pathological laughter is developed with no specific stimulus; is not connected with emotional changes; has no voluntary control of its duration, intensity or facial expression; and sometimes comes with "pathological crying."[176]

The therapeutic benefits of the different types of laughter concern in particular the first two, spontaneous laughter and self-induced simulated laughter, and stimulated laughter to a lesser extent. Table 5 shows the main characteristics of the first two types of laughter. Spontaneous laughter and self-induced simulated laughter are not that different than one might believe initially. The only clear difference is in the initial stage of providing a stimulus and the triggering of laugher. In the first case, an external

TABLE 3 Effects of Laughter on Health-related Physiological Outcomes*

Physiological Outcome	Intervention and Results
Muscle relaxation	Periods of intense laughter are followed by relaxed muscle tone[98] or H-reflex depression.[99]
Heart rate, respiratory rate, blood pressure, EE, oxygen levels	Laughter led to immediate increases in heart rate, respiratory rate, and oxygen consumption[100-104] and may improve oxygen saturation levels[105]; laughter did not significantly affect heart rate[106] or oxygen consumption[34]; following laughter, there is a corresponding decrease in heart rate and respiratory rate[16]; laughing had an acute effect on systolic blood pressure[100,107]; no significant effect[34,108]; laughter with physical exercise may be effective to lower the blood pressure as a long-term effect[109]; genuine voiced laughter caused a 10% to 20% increase in EE and heart rate above resting values, which means that 10-15 min of laughter per day could increase total EE by 10-40 kcal.[110]
Effect on cardiovascular performance	Laughter increased stroke volume and cardiac output, and decreased arterial-venous O_2 difference and systemic vascular resistance[34]; laughter elicited by cinematic viewing improved endothelial-dependent vasodilation[111]; laughter decreased levels of serum cortisol and plasma von Willebrand factor[112]; laughter induced by a comic movie led to a significant decrease in aortic stiffness and wave reflections.[113]
Cardiovascular protection (long-term effects)	Inverse association between propensity to laugh and coronary heart disease[114]; fewer arrhythmias and recurrences of myocardial infarctions during cardiac rehabilitation (after myocardial infarction) when self-selected viewed humor was used as an adjunct to standard therapy[115]; mirthful laughter led to lower the incidence of myocardial infarction in high-risk diabetic patients.[116]
Endocrine stress markers (cortisol, CgA) and various hormonal measures	After watching a comic film, laughter reduced serum cortisol levels,[117-119] increased salivary CgA levels,[120] increased urinary excretion of epinephrine and norepinephrine[121]; appeared to reduce serum levels of dopac (dopamine catabolite), epinephrine, and HGH[118]; no significant changes were found in serum prolactin, beta-endorphins, ACTH, and norepinephrine[117,118]; laughter increased beta-endorphins and HGH[122]; laughter elevated breast-milk melatonin in both healthy and atopic eczema mothers[28]; behavior of perceptual anticipation of mirthful laughter decreased serum cortisol, epinephrine, and dopac.[123]
Neuroimmune parameters: salivary IgA (SIgA), serum immunoglobuline levels, NK cell activity, leukocyte population	Exposure to a humorous stimulus increased NK activity[29,117,124]; did not significantly increase NK activity[125]; increased SIgA[30,126-129]; increased serum IgA, IgG, IgM[147]; relative increase in total leukocytes and specific leukocyte subsets.[117]
Pain threshold and tolerance	Laughter (film-induced) increased pain tolerance and discomfort thresholds.[130-135]
Effects in asthma and COPD patients	Viewing a humorous film decreased bronchial responsiveness in asthmatic patients[136]; laughter and smiling induced by a humor intervention (clowning) were able to reduce hyperinflation in severe and very severe COPD patients.[137]
Effects in patients with rheumatoid arthritis (neuroimmune parameters)	Mirthful laughter decreased serum proinflammatory cytokine levels,[138] growth hormone, and IGF-1[139]; increased antiinflammatory cytokine levels[138]; or reduced serum interleukin-6 levels.[37,140]
Effects in type 2 diabetes patients (blood glucose levels, neuroimmune parameters, others)	Inhibitory effect of laughter (elicited by a comedy show) on the increase of postprandial blood glucose level[141]; laughter influenced the gene expression profile in the peripheral blood leukocytes[142]; laughter may prevent the exacerbation of diabetic nephropathy[36] and diabetic microvascular complications[143]; laughter may contribute to amelioration of postprandial blood glucose elevation through a modulation of NK cell activity caused by upregulation of relating genes[144]; mirthful laughter led to lower the serum epinephrine and norepineprine levels, decreased inflammatory cytokines and C-reactive protein, and increased HDL cholesterol in high risk diabetic patients with hypertension and hyperlipidemia.[116]
Effects in atopic dermatitis patients (allergy parameters)	Laughter and humor reduced allergen-induced wheal reactions,[27] reduced allergen-specific IgE production,[145] improved night-time wakening,[146] and reduced serum neurotrophin levels.[147]
Other: skin response, binocular rivalry, diaphragm electromyography	Laughter increased galvanic skin response[148] or conductance,[149] indicating activation of sympathetic nervous system; laughter episodes (while narrating jokes) led to cessation of binocular rivalry[150]; hearty laughter (while viewing a comic video) elicited waving patterns clearly different from those of coughing or sneezing.[113]

*EE indicates energy expenditure; CgA, chromogranin A; HGH, human growth hormone; ACTH, adrenocorticotropic hormone; Ig, immunoglobulin; NK, natural killer; COPD, chronic obstructive pulmonary disease; IGF-1, insulin-like growth factor 1; HDL, high-density lipoprotein.

TABLE 4 Effects of Laughter on Health-related Psychological Outcomes

Psychological Outcome	Intervention and Results
Effects on mood, stress, depression and/or anxiety symptoms	Laughter improved mood and positive affect in healthy adults[151-153]; temporarily improved depressed mood in depression[154]; moderated stress in healthy adults [112,155,156] or anxiety.[106,157]
Effects on psychotic symptoms	In patients with schizophrenia, a humor and laughter intervention reduced hostility and depression/anxiety scores; improved activation scores and social support[41,158]; lowered the levels of psychopathology; and improved social competence.[159]
Performance, personal efficacy, coping abilities	Purposeful laughter significantly increased different aspects of self-efficacy, including self-regulation, optimism, positive emotions, and social identification, and maintained these gains at follow-up[112]; laughter and humor improved coping abilities.[40,160,161]
Psychotherapy, group therapy, desensitization	Conversational laughter helped prevent or resolve risk of confrontation in addiction group therapy[162]; humor desensitization reduced fear as effectively as traditional techniques.[163]
Quality of life, patient care, well-being	Laughter and humor improved quality of life in depressed patients [164,165]; promoted psychological well-being and enhanced patient care in different clinical settings.[25,39,58,78,79,166]

stimulus (coming from other than the laugher) is commonly provided, and laughter is triggered. In the second case, it occurs by the laugher him/herself (purposeful laughter). Modern laughter therapy is based on the following fundamental principle: through several exercises, techniques, activities, and dynamics, a person or a group of people is taken to a feeling of lack of inhibitions to achieve the binomial self-induced laughter–spontaneous laughter and to experience its physical, psychological, emotional, and spiritual benefits. The human brain is not able in the end to distinguish spontaneous from self-induced laughter ("motion creates emotion" theory); therefore, their corresponding health-related benefits are alleged to be alike, as some authors contend.[18] However, further research is warranted to confirm this assumption (no studies were identified in this review). Indeed, self-induced stimulated laughter may lead to a higher "laughter exposure" both by achieving greater intensity and duration at will or by triggering contagious and turning into spontaneous laughter, which might create greater accompanying psychophysiological changes.[4,16] As a laughter type, self-induced simulated laughter is becoming increasingly popular worldwide, as it is the foundation of the Laughter Club movement (Laughter Yoga).[18,177]

Laughter Research Pitfalls and Flaws

Though some of the studies on the effects of laughter

TABLE 5 Laughter Medicine: Main Characteristics of Spontaneous Laughter and Self-induced Simulated Laughter

	Spontaneous Laughter	Self-induced Laughter
Genuine expression of positive emotions	Yes	Sometimes
Humor-related	Very often, but not always	Rarely
Laughing "at" or "with" others	Commonly "at"	Always "with"
Personal engagement/ effort to think	Often necessary	Rarely necessary
Presence of "Duchenne laughter/smile"*	Very often (when not fake)	Often
Together with bodily motion	Yes (uncontrolled)	Yes (controlled)
One's own free will	No, unrelated	Yes, purposeful
Triggering off stimulus	Identifiable (external)	None (self-induced)
Contagious	Yes (often)	Yes (very often)
Self-control on intensity and duration	Minimum or less	Maximum or more
Presence of vocal sounds	Common (50%)[197]	At will
Most common vocalizations	Ha/ho	At will: ha/he/hi/ho/hu and others
Evidence of therapeutic value in medicine	Some studies conducted	Very few studies
Best dynamics for experimenting laughter	In a group	Alone/in a group

*Contraction of the muscles around the eye socket.

marked a new start in research called psychoneuroimmunology,[178] which explores the interactions between the central nervous system and the immune and endocrine systems, not all of these research attempts have been completely successful. The highest-quality studies were executed on the effects of a humorous stimulus (comic movie) and subsequent laughter on pain tolerance, which provide strong evidence of increased long-term effects not merely due to distraction.[7] However, there is still not enough empirical evidence that hearty laughter has pain-killing effects or that laughter stimulates the production of endorphins, other neurohormones (human growth hormone, oxytocin, melatonin, prolactin, adrenocorticotropic hormone) and neurotransmitters (serotonin, dopamine, others).[3,9,179] The weakest investigations are those on endocrine stress markers (serum cortisol, salivary, chromogranin A levels, others) and immune system parameters.[4,6] The results were not consistent or conclusive because methodological flaws might have prevented the expected physiological "benefits" from being detected.[19]

The criticisms of the weaknesses and quality of the studies conducted are focused mainly on internal design flaws and invalid/lack of generalizability of results. The main internal flaws identified, some of them reported elsewhere,[5-8] included the following: small sample size (≤10 participants), no randomized design, inadequate or nonexistent control groups, no standardized baseline measurement, unreliable measures of blood and saliva assays, no statistical tests or too many, failure to distinguish laughter from humor, failure to confirm the presence of laughter, suboptimal laughter exposure (either insufficient duration or intensity), failure to differentiate short-term from long-term effects, and many other confusion factors. Collectively, current available data reviewed suffer simply from too few well-designed studies to draw valid conclusions about some of the health-enhancing changes produced from laughter.[179]

DISCUSSION

In this review, the focus was placed on laughter research occurring either in the presence or humor or in its absence and related health benefits. This distinct approach makes this narrative review unique, as most of the previous studies and reviews have assessed mainly (sense of) humor interventions and their outcomes, where, unfortunately, laughter, as a common response to humorous stimuli, was not always present, measured, or monitored.[4] However, this review may have been limited by the amount of humor and laughter literature available; the numerous definitions and fields and different methodologies and outcomes from where it emerged; the failure to adjust for the presence, duration, or intensity of laughter and corresponding effects; and the overall complexity of the laughter phenomenon itself.

Laughter Research Challenges and Future Directions

Laughter research designs can be quite challenging. As previous studies indicate, some individuals who are exposed to a humorous stimulus do not always laugh. To help control for this, it is crucial that future laughter research includes some measure of subject response to the humorous stimuli whenever it is used to help elicit laughter. An alternative design to help preclude laughter absence and to adjust for its intensity and duration is to conduct self-induced simulated laughter intervention trials. Although it has been reported that very few people are able to convincingly laugh on command,[7] self-induced laughter is entirely achievable and appears to be the most realistic, sustainable, and generalizable intervention to be used in future laughter research. In this review, only two studies experimenting with purposeful laughter and then assessing its health effects were identified.[180,181] Another methodological concern is that of control groups. The need for at least two additional control groups has been suggested[6]: a negative one to control for the effect of general emotional arousal and a positive one to control for positive emotions that are not necessarily laughter-oriented. Larger samples of healthy subjects and trials in different clinical populations also are warranted. Therefore, it may be useful for researchers in an area dominated by psychology to carry out interdisciplinary studies involving experts from different health care fields.

Laughter researchers also may have difficulty defining precise and measurable outcomes for a therapy for which the main effect is often subjective or dependent on the skill of the practitioner and the laugher him/herself. Laughter therapy often has to be tailored for an individual's specific needs and may not be able to be studied at a conventional "active ingredient" or "dose" level. Moreover, individuals frequently use a variety of CAM modalities simultaneously or adjunctively with conventional therapies, which may attenuate or magnify treatment effects. Some of these challenges have not been properly addressed through alternative study designs. Collectively, research on laughter is still in its infancy, and many efforts are required to enhance the quality and validity of trial designs and health-related outcomes, with the imperative need of distinguishing (sense of) humor and laughter. Clearly, more groundwork is needed to determine the best methods of assessing and documenting health-related outcomes on laughter in different patient populations. One of the first steps may have been performed by Kimata et al,[182] who recently published some remarkable results on "diaphragm EMG (electromyogram)," the first exact system for the measurement of laughter itself. This measuring system can specify the starting point and duration of laughter precisely of 1/3000 second; therefore, it will make detailed analysis of the healthy effects of laughter possible in different clinical settings. Furthermore, the authors state that this method is suitable as a precise way to assess any kind of laughter and does not require any special medical or mechanical techniques, so it also may be useful for other, nonmedical purposes.

Laughter as Medicine

Western thinking around laughter as a medicine began to crystallize in 1976 when Cousins published his "Anatomy of an Illness." However, inviting and facilitating laughter in therapy is not the same as developing and using humor to make the patient laugh. Humor is not necessary to have subsequent laughter. Adults can laugh without it, as do infants and children. While laughter medicine takes skill and time to be developed, laughter therapy itself can be implemented easily and is cost-effective in patient care.[2,3] Health care professionals do not have to be stand-up comics, clowns, or magicians to bring laughter into clinical settings. Just acknowledging how important laughter can be and having a cheerful and spirited approach is a good place to start. After all, half of the benefit of laughter, in addition to healing, is sharing it.[183] Nevertheless, the health community is still slow in accepting and considering laughter as a healing tool within CAM.[184] In order to offer patients the benefits of laughter, health care professionals must be willing to break loose from conventional therapeutic constraints, regain their own laughter, and learn the techniques to facilitate laughter in their patients. Laughter deserves a special place in medical practice and daily life. This is the mission of the Association for Applied and Therapeutic Humor, an international community of medical, education, and public speaking professionals who study, practice,

and promote healthy humor and laughter. Based in Spain, the "Organización Mundial de la Risa" also is investing in laughter research and training.

Laughter Medicine for Health Care Professionals

Laughter is important in medicine and may enhance conversation between health care professionals and patients.[185,186] The ability to laugh with a patient is a sign of good rapport. Mutual understanding while sharing some laughs may be more important than the diagnosis or formal treatment.[187] Laughter is also a quality-of-life and well-being enhancement therapy for both health care professionals and patients.[188] Laughter may help dissipate tension, fear, frustration,[64] and other stress such as "burnout," which is becoming increasingly more common and troublesome among today's medical staff.[189,190] However, laughter is an often neglected resource in managing personal and professional stress. Proponents of "positive psychology" have identified humor and laughter as one of the 24 positive personal "values and attributes."[191,192] Therefore, health care professionals can play a significant part in eliciting better understanding of laughter benefits in clinical conditions and real-world life for both patients and themselves. But like any other skill, the effective use of laughter for therapeutic purposes needs to be learned, practiced, and developed. Practical guidelines or advice on laughter therapy have not been developed as yet to help health care professionals (and others) implement laughter techniques in their health care portfolio.

CONCLUSIONS

According to this review, the following can be concluded on the evidence-based therapeutic value of laughter in medicine:

- Current empirical data for the psychological benefits associated with laughter is stronger than that of its physiological benefits; however, further well-designed research is warranted in all of these areas.
- Overall, there are not enough research findings to conclude that laughter is an all-around healing agent, but there is sufficient evidence to suggest that laughter has some positive, quantifiable effects on certain aspects of health.
- Laughter as a medicine, as a mind-body therapy for health care, is almost never used in "traditional" clinical settings and often overlooked as a form of CAM.
- In this era of evidence-based medicine, it seems appropriate that laughter therapy takes its place as a CAM discipline in the prevention and treatment of illnesses.
- The following seems to be good advice for both patients and health care professionals: "Add laughter to your working and daily life, remember to laugh regularly, share your laughs, and help others to laugh, too."

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