

Spontaneous Laughter, Simulated Laughter, and Laughter Therapies/Yoga: A Scoping Review (Part II)

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Abstract

This article provides a scoping review of more than 400 studies on laughter over the past 50 years. Given the number of studies and length of this review, it has been published in two parts. Part I was published last year. It extended the work on the 28 previous reviews and clarified laughter terminology to parse out fact from fiction. Part I concentrated on neurological laughter research and the differences between spontaneous (real) and simulated (fake) laughter, and laughter therapies/laughter yoga. It partitioned the studies according to various physiological and psychosocial outcome measures. Those measures form the foundation for clinical applications of laughter. Unlike numerous previous reviews, Part II examines the quality and quantity of laughter research and the harmful effects of spontaneous laughter. The evidence accumulated on these topics indicates that spontaneous, not simulated, laughter or laughter therapy produces the strongest neurological and physiological outcomes. The primary effects from 133 studies include decreased cortisol and catecholamines (stress hormones), increased natural killer (NK) cell activity and immunoglobulins (immune system), reduced cardiovascular disease, decreased blood pressure, increased pulmonary functions, and release of endorphins. In contrast, there are only five studies on simulated laughter. More than 200 studies of laughter therapies over the past 20 years found decreased cortisol, blood pressure, and blood glucose. Psychosocially, most of the research produced decreased stress, depression, and anxiety, increased pain tolerance, and improved mood. These trends should be considered tentative due to the lack of comparability among the different therapies. Each therapy typically contains a variety of exercises (simulated laughter, stretching, dancing, clapping, breathing, and meditation) administered in a group environment. There are no standard therapeutic techniques, prescriptions, or protocols. This lack of standardization renders inferences about their effectiveness for clinical and research

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applications nearly impossible. Specific recommendations address previous studies' weaknesses to improve future research quality.²

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Introduction

As you will recall with considerable difficulty, Part I of this article was published a year ago. While many of you may not remember what you had for breakfast yesterday, here is a refresher list of the eight topics covered in *Part I*: (1) review search methods, (2) previous reviews of laughter research, (3) backstory of laughter research, (4) laughter terminology, (5) neurological research on laughter, (6) research profile of spontaneous laughter, (7) research profile of simulated laughter, and (8) research profile of laughter therapies and laughter yoga.

Part 1 reviewed the nuts-and-bolts specific studies in the trinary categories of laughter—spontaneous, simulated, and laughter therapies/laughter yoga—based on their physiological and psychosocial outcome measures. That review serves as the foundation for Part II, which provides a critical examination and CliffsNotes' summary of the research. *Part II* covers four topics: (9) harmful effects of spontaneous laughter, (10) quality and quantity of laughter research, (11) conclusions, and (12) limitations of the review.

Harmful Effects of Spontaneous Laughter

Ferner and Aronson (2013) summarized the research on possible harmful effects. The adverse effects on mental health are minor (negligible). Here are the physiological results:

- *Cardiovascular*: can cause syncope, cardiac and esophageal ruptures, and arrhythmias
- *Respiratory*: can trigger an asthma attack, cause pneumothorax, and provoke inhalation of foreign bodies

² This article is dedicated to the memory of my dear friend, mentor, and colleague Dr. Lee S. Berk. His pioneering work in psychoneuroimmunology and the therapeutic benefits of mirthful laughter inspired countless researchers, practitioners, and educators around the world. His ground-breaking research beginning in the 1980s to the present gave us new insights into humor, laughter, and health. Our conversations about whether this article should be written are indelibly marked in my memory. This review would not have been tackled without his encouragement. He will be greatly missed. I hope the contents and his contributions cited herein will honor his legacy.

- *Nervous system:* can produce cataplexy, a sudden loss of muscle tone, cause headaches, and precipitate a cerebral infarct
- *Gastrointestinal:* can cause protrusion of abdominal hernias (from side-splitting laughter)
- *Musculoskeletal:* can dislocate the jaw
- *Urinary tract:* can cause stress or giggle incontinence
- *Pulmonary:* may be harmful with potential lung hyperinflation in chronic obstructive pulmonary disease (Bennett et al., 2014; Lebowitz, Suh, Diaz, & Emery, 2011).

Mora-Ripoll and Casado (2010) also advised caution with patients having recent surgery, heart disease, or glaucoma and evident discomfort or pain. Despite these possible effects, Ferner and Aronson (2013) concluded that “laughter in any form carries a low risk of harm and may be beneficial” (p. 3).

Quality and Quantity of Laughter Research

Despite the quantity of studies investigating laughter, the quality of the research reviewed and the numerous limitations identified in previous reviews render the interpretation and application of their results questionable. The problems identified in this section limit the replicability of effective interventions and the generalizability of results to similar and broader populations of participants.

The methodological weaknesses found in the earlier studies also characterize the studies within the categories of outcome benefits. There are four major areas of weakness: (1) sampling, (2) interventions, (3) research design, and (4) outcome measures. These sins of commission are described next.

Sampling

The most common sampling designs are convenience (available volunteers) and purposive sampling (participants chosen according to specific inclusion criteria). Patients are not selected randomly from a clearly defined population. Consequently, the samples in these studies are unrepresentative of any population. That restricts the generalizability of results to participants with a demographic and mental and physical health profile similar to those in the study.

A second sampling concern is inadequate sample sizes. There are numerous studies with single digits or fewer than 20 per group. Those sizes are unreliable, can bias the results, and

lower the statistical power of the research design (50 per group is desirable to attain 80% power to detect significant differences).

Spontaneous Laughter Intervention

The intervention or treatment in studies of physiological outcomes is the simplest and cleanest to develop and execute. It typically takes the form of a comedy TV or movie video, cartoon, or other humorous stimulus; the control is a drama or documentary video or nothing. The differential effects of the various stimuli and controls are unknown. Which ones produce the largest impact on the outcome variables? Standardizing the treatments for each individual without a group effect is essential unless that is part of the design.

Simulated Laughter Intervention

Simulated laughter can be induced by a certified laughter or yoga leader.

Laughter Therapy and Yoga Intervention

The mixture of elements in a given therapy intervention will vary from application to application in frequency, intensity, time, sequence, and type of laughter (Louie, Brook, & Frates, 2014). Typically, simulated laughter sessions occur once or twice a week over 6–8 weeks for 20–45 minutes in a group setting with different ages, health conditions, and physical positions (standing, sitting, or lying down), with or without props (Mora-Ripoll, 2017). The choice of elements and the characteristics of their execution vary from study to study, along with the setting or location and type of participants or patients. More confusion occurs when a humor stimulus, such as a humorous video or comedian, is used to produce spontaneous instead of simulated laughter in the package. Each package and study is unique. There is no single prescription or standardization for the therapy and its administration. The exercise(s) that yields positive outcomes cannot be identified, isolated, or replicated with other patients. Those outcomes are attributable to the entire package effect.

From a research or clinical perspective, the package mentality confounds the meaning and application of the results. It is an interpretation nightmare. There is no comparability from one study to another. Not knowing what exercise contributed to the success of the intervention confounds the significance of the results. It affects the efficiency of the therapy. The package

may add up to less than the sum of its parts. For example, if the fake laughter by itself produced the outcomes, why include four other nonlaughter exercises? They may be justifiable for different reasons. Unfortunately, past studies of laughter therapy cannot answer that hypothetical.

Research Design

The design's rigor determines the study's internal validity and the inferences that can be drawn from the results. Pre-experimental studies, such as the one-sample pre-post design, were common throughout almost all categories. The single sample, which is usually small, without a comparison control group will automatically raise questions about the validity of the results. A quasi-experimental design with a nonequivalent comparison group may also weaken the interpretation of significance unless a design adjustment (e.g., matched groups) or statistical equivalence (e.g., blocking or covariate) can be attained. The randomized, control group design is still the “gold standard.”

In addition to these design issues, isolating the individual exercises in the intervention is important. The therapeutic laughter studies reviewed previously do not examine those exercises. Measuring the specific effects of each exercise can be informative in refining the intervention. That analysis can reveal what each exercise contributes to the outcomes.

Outcome Measures

The reliability and validity of all measurement tools are critical indices of quality. For example, if multiple blood assays are drawn before, during, and after the intervention, the participants' anxiety toward those draws should not affect the outcomes. Their effects could confound the results of the intervention.

The tests, rating scales, and questionnaires used to measure psychosocial outcomes must also be thoroughly tested. Measures of anxiety, stress, depression, quality of life, happiness, self-esteem, life satisfaction, etc. should have psychometric evidence collected on the different samples of participants to whom they are administered. Finally, laughter itself is typically not measured. The frequency and duration of laughter may explain other effects on the outcome variables. The diaphragm electromyogram has been tested by Kimata et al. (2009) to provide an accurate measure of duration. More research is needed on techniques researchers can use in laughter studies.

Conclusions

Neuroimaging Research on Laughter

PET and MRI scans found spontaneous and simulated laughter follow different neural and emotional pathways. The neurological studies on spontaneous laughter indicated the following conclusions that differentiate their characteristics from those of simulated laughter. Spontaneous laughter:

- cues activated areas of the brain associated with positive emotional and cognitive processes.
- is more contagious than simulated laughter, in terms of how happy people felt when hearing those laughs and how much they made them want to join in.
- affects the whole body—visually (facial expressions), auditorily (vocal output), and with thoracic muscle spasms.
- is acoustically different from simulated laughter with greater intensity, variability, higher pitch, and increased noisy features. Most people can distinguish real from fake.
- promotes social bonding and feelings of togetherness, making large social networks possible.
- triggers the release of endorphins in the brain regions responsible for arousal and emotion. They mitigate negative emotions and stress, relieve pain, and produce feelings of pleasure that support forming and maintaining social bonds.

Physiological Research on Spontaneous Laughter

Beyond the early physiological research on real laughter (32), most of the 101 studies completed over the last three decades focused on natural killer (NK) cell activity and immunoglobulins (immune system), cortisol and catecholamines (stress hormones), cardiovascular disease, blood pressure, pulmonary functions, and endorphins. The results of these outcomes are encouraging, but further studies are needed. The most recent research has addressed respiration and oxygen saturation, trunk muscles, heart rate, blood glucose, memory and recall, cognitive function, and inflammation. These areas require further systematic investigation.

Research on Simulated Laughter

With only five studies conducted on simulated laughter, no valid conclusions can be drawn to recommend that laughter by itself for any therapeutic applications. Since it has become a key element in laughter therapy and yoga, research on its efficacy could be pivotal to designing therapeutic protocols for patients in various clinical settings.

Physiological Research on Laughter Therapy and Laughter Yoga

This research generated the most significant chunk of studies (14) on cortisol. Others focused on blood pressure, blood glucose, heart rate, and pulmonary function. The overall sparsity of research (41 studies) and their quality suggest it is only beginning. Further, there is no evidence on which exercises in the therapeutic package contributed to the specific outcome effects.

Contrary to several previous reviews (Alici & Dönmez, 2020; Mora-Ripoll, 2011, 2017; Yim, 2016), the mental (emotional and cognitive) and physical (visual, auditory, and thoracic muscle spasms) characteristics of spontaneous laughter do not permit any generalizations of their physiological research results to simulated laughter and laughter therapy (aka *Motion Creates Emotion Theory*). The evidence indicates such assertions are spurious. Furthermore, there is no evidence to confirm the transition from simulated to spontaneous laughter, the contagiousness of simulated laughter, or its effects during a laughter therapy session.

Psychosocial Research on Laughter Therapy and Laughter Yoga

This research produced 169 studies, with the heaviest concentration on the outcomes of depression, stress, anxiety, pain, and mood. There are fewer on sleep, quality of life, happiness, positive feelings, self-esteem, and life satisfaction. Again, those studies' structure does not permit inferences on which exercises or combination of exercises in the laughter packages produced the results.

Despite the quality control of these studies and the limitations in interpreting the “package effects,” previous reviewers have concluded that laughter therapy and yoga provide non-invasive, non-pharmacological, and cost-effective interventions with a variety of physiological and psychosocial health outcomes (Mora-Ripoll, 2017; Yim, 2016). What do you have to lose (Louie et al., 2014)? Without definitive evidence on those interventions, could they

be justified when no other feasible alternative therapy exists or as a complementary treatment? Probably the latter is the safest choice.

Future Research on Laughter Therapy

Despite over 200 studies of laughter therapies and the positive package-effect outcomes, the results DO NOT address some of the most critical issues. There are serious sins of omission in the research. At present, evidence is needed to determine the most effective

- a. individual exercises and activities, especially fake laughter
- b. length, frequency, intensity, timing, and type of exercises
- c. combination of exercises
- d. sequence of exercises
- e. exercises that can and should be replicated with similar patients (generalizability)
- f. measures for physiological and psychosocial outcomes
- g. frequency, intensity, and duration of fake laughter

The Bottom Line

The research evidence summarized in this review indicates the strongest neurological and physiological outcomes are produced from spontaneous, not simulated, laughter. The paucity of research on simulated laughter undermines the efficacy of laughter therapy and yoga research conclusions. There is no evidence to evaluate what the simulated laughter embedded in the therapy packages contributes to the outcomes. Therefore, contrary to the recommendations in previous reviews, it would seem appropriate to seriously consider real laughter with a humor stimulus as part of those packages until there is sufficient evidence to justify the application of fake laughter. The findings by Law, Broadbent, and Sollers (2018) comparing the two types of laughter on cardiovascular effects do not support Dr. Kataria's *Motion Creates Emotion Theory*. There is no evidence for the generalizability of spontaneous laughter's physiological and psychosocial benefits to simulated laughter or the contagious transition of the former to the latter.

The preference for spontaneous laughter as the vehicle to execute laughter therapy is based on the accumulated evidence. However, there can be cases where practical factors may indicate simulated laughter as more appropriate. Van der Wol and Kok (2019) identified specific advantages of simulated laughter with participants with reduced physical mobility or cognitive

ability. It can be used with patients seated or lying down, individually or in a group, and does not rely on verbal skills to understand a joke or other humor.

Due to the weaknesses and limitations of the studies of laughter therapy, the design and structure of those therapy sessions in clinical practice require considerable attention. Here are a few recommendations:

1. Train laughter leaders and qualified/certified therapists to properly execute the different exercises and treatments following a specific protocol or guidelines.
2. Test the effectiveness of each exercise on the intended outcome variables.
3. Test the most effective timing, frequency, intensity, duration, and sequence of exercises for the outcomes.
4. Determine the most efficient and cost-effective combination of exercises that can be standardized for the therapist to implement and replicated by others.
5. Measure the frequency, intensity, and duration of the induced spontaneous or simulated laughter.
6. Conduct randomized controlled trials with adequate sample sizes and reliable and valid outcome measures of the preceding tests so that there is evidence to undergird practice.

Limitations of the Review

This scoping review is limited to the studies identified in previous reviews and the various electronic and manual searches and search terms mentioned previously. The confusion over the terminology and definitions of therapy in those studies may have produced errors in categorizing the studies according to the specific outcomes. That is problematic since this review was intended to clarify terminology and display the distribution of studies to address areas of need.

No study-by-study critiques were possible or intended in this review. Instead, the emphasis was on the distribution of studies by outcome variable to pinpoint where the research has occurred and the gaps that need to be addressed.

Including all possible studies with the range of quality noted previously restricts the validity of the summary of the overall results of the different outcome categories. Those studies with significant design issues diluted the pool of studies collected by variable. Hopefully, the research published in the interim between the time this review was completed and its date of publication will not fit into that pool.

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