Article

What Makes Things Funny? An Integrative Review of the Antecedents of Laughter and Amusement

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Caleb Warren[1], Adam Barsky[2], and A. Peter McGraw[3]

Abstract

Despite the broad importance of humor, psychologists do not agree on the basic elements that cause people to experience laughter, amusement, and the perception that something is funny. There are more than 20 distinct psychological theories that propose appraisals that characterize humor appreciation. Most of these theories leverage a subset of five potential antecedents of humor appreciation: surprise, simultaneity, superiority, a violation appraisal, and conditions that facilitate a benign appraisal. We evaluate each antecedent against the existing empirical evidence and find that simultaneity, violation, and benign appraisals all help distinguish humorous from nonhumorous experiences, but surprise and superiority do not. Our review helps organize a disconnected literature, dispel popular but inaccurate ideas, offers a framework for future research, and helps answer three long-standing questions about humor: what conditions predict laughter and amusement, what are the adaptive benefits of humor, and why do different people think vastly different things are humorous?

Keywords

humor, laughter, comedy, amusement, emotion, positive psychology

Laughter occurs across all cultures and in a wide range of situations (Apte, 1985; Lefcourt, 2001). Although people from Korea to Kazakhstan speak different languages, they laugh in more or less the same way (Ekman & Friesen, 1971; Sauter et al., 2010). Humor appreciation precedes language development. Infants as young as 3 months old laugh and respond with positive emotion to the sound of laughter (Mireault et al., 2012). Children who are unable to see or hear due to congenital blindness or deafness still laugh while playing (Black, 1984). The ubiquity of humor appreciation extends to nonhuman mammals. Apes (Gervais & Wilson, 2005), canines (Simonet, 2004), and even rats (Panksepp, 2005) make sounds that resemble laughter.

Humor provides a variety of physiological, psychological, social, and economic benefits. Experiencing humor boosts positive emotions while mitigating the perceived intensity of negative life events, helps people cope with stress and anxiety, makes utilitarian pursuits more enjoyable, improves creativity and aspects of mental health, and helps people manage relationships (Galloway & Cropley, 1999; Isen et al., 1987; Keltner & Bonanno, 1997; Martin, 2002; Samson & Gross, 2012; see Martin & Ford, 2018; Warren et al., 2018 for reviews). Similarly, people who are good at making others laugh have an easier time attracting romantic partners (Goodwin, 1990; Goodwin & Tang, 1991; Kenrick et al., 1990), making favorable impressions on others (Bitterly & Schweitzer, 2019; Cann & Calhoun, 2001; Greengross & Miller, 2011; Li et al., 2009), and navigating potentially contentious social interactions, such as negotiations and Thanksgiving dinners (Kurtzberg et al., 2009; Smith et al., 2000).

These benefits come with an important caveat: creating humor is difficult and failed attempts do more harm than good (Warren et al., 2018). Neither the *Three Stooges* nor cat memes will help someone overcome personal or social hurdles if the person does not think that stooges or grumpy cats are funny. People and organizations that try but fail to be funny are perceived to be incompetent, insensitive, or both (Bitterly et al., 2017; Flaherty et al., 2004; Warren & McGraw, 2013). Instead of lifting emotions, attracting admiration, and resolving conflict, failed comedy tends to elicit disgust, anger, and disapproval (Alden et al., 2000; Bell, 2009; Smeltzer & Leap, 1988; Warren et al., 2018).

Given the clear benefits of success and costs of failure, understanding what makes something humorous is important for researchers, writers, entertainers, and anyone who has attempted to tell a joke or funny story (i.e., everyone).

[1]The University of Arizona, Tucson, USA
[2]University of Melbourne, Australia
[3]University of Colorado Boulder, USA

Corresponding Author:
Caleb Warren, Marketing Department, Eller College of Management, The University of Arizona, McClelland Hall 320, 1130 E. Helen St., Tucson, AZ 85721-0108, USA.
Email: calebwarren@arizona.edu

However, the dramatic variability in what is perceived to be funny across cultures, situations, and individuals makes humor difficult to successfully create (and study). There is little overlap between parody, pratfalls, puns, and peek-a-boo, yet all are capable of eliciting laughter and amusement (Martin & Ford, 2018). A joke that is offensive today may be funny tomorrow and boring next week (McGraw et al., 2014). Grotesque game shows may be hilarious to Japanese audiences, but few Americans experience the same enjoyment (McGraw & Warner, 2014). Similarly, racist jokes incite laughter from racists but scorn from nearly everyone else.

Scholars have proposed more than 20 humor theories to try to account for the variability in stimuli, contexts, and audiences that causes something to be perceived as funny. These theories attempt to identify a set of psychological conditions or characteristics (i.e., antecedents) that trigger laughter, amusement, and the perception that something is funny. Unfortunately, to date, there is no consensus about which theories—or which antecedent conditions—best explain why some things are perceived to be funny but others are not (Martin & Ford, 2018; Morreall, 2009).

In this article, we review and integrate the trove of empirical data generated from surveys, lab experiments, animal behavior, neuroimaging, artificial intelligence (AI), and linguistic analyses to evaluate which humor theories offer the most compelling answer to the question of what makes things funny. In part because humor research is multidisciplinary, the literature is jingled and jangled with jargon and mired in a multiverse of theories, many of which have been vetted with only a narrow range of data. Our review, the first in a major psychology journal in nearly 30 years (Wyer & Collins, 1992), attempts to bring conceptual clarity to this literature by disassembling humor theories into their component pieces (i.e., antecedent conditions) and examining how well each of these antecedent conditions fits with the data collected over the past 50+ years. We conclude by reassembling a consensus humor theory with the antecedent conditions that best distinguish humorous from nonhumorous experiences. Importantly, these antecedent conditions refer to cognitive (e.g., appraisals) and affective (e.g., surprise) responses to stimuli by an individual, rather than attributes of the stimulus itself (e.g., the structure of a joke or the timing of a pratfall). Thus, we seek to create a consensus theory of the psychological conditions that trigger humor appreciation, not a formula for how to write knock-knock jokes.

Our consensus theory provides insight into important questions that have resisted satisfying answers. For instance, while we know that humans and many nonhuman mammals appreciate humor, scholars do not have a clear understanding of the adaptive functions of humor. Moreover, while we recognize that what people find funny (and *not funny*) is infinitely variable, and scholars lack the theoretical tools to explain this variability. But before we can tackle these questions, we need to define and distinguish between three constructs related to humor: sense of humor, comedy, and humor appreciation.

Defining Comedy, Humor Appreciation, and Sense of Humor

The term humor describes at least three related, yet conceptually distinct, constructs (Martin & Ford, 2018; Valitutti et al., 2016; Warren et al., 2018; Wyer & Collins, 1992): (a) an individual difference in the tendency to laugh or to amuse others (e.g., a disposition to tell or laugh at jokes), which we label *sense of humor*; (b) a stimulus that elicits laughter and amusement (e.g., a joke), which we refer to as *comedy*; and (c) a psychological state associated with laughter and amusement (e.g., the response to a joke), which we call *humor appreciation*. We use humor as a constellation term to refer to these three related yet distinct constructs (Table 1; see also Warren et al., 2018).

Researchers in personality, developmental, and clinical psychology often operationalize humor as a relatively stable tendency to laugh and be amused or to generate laughter and amusement in others (Greengross & Miller, 2009; Hehl & Ruch, 1985). We refer to stable individual differences in the tendency to produce, know, use, comprehend, appreciate, and enjoy comedy as a *sense of humor* (Hehl & Ruch, 1985; Martin & Ford, 2018). Sense of humor refers to a diffuse trait capturing individual differences in taste, temperament, attitudes, and ability (Eysenck, 1942; Martin & Ford, 2018). There are numerous self-report scales attempting to measure sense of humor, including the "Sense of Humor Questionnaire" (Svebak, 1974), the "Situational Humor Response Questionnaire" (Martin & Lefcourt, 1983), the "State-Trait Cheerfulness Inventory" (Ruch & Köhler, 1998), the "Need for Levity" scale (Cline et al., 2011), and the "Humor Style Questionnaire" (Martin et al., 2003). Research on sense of humor has made important contributions to our understanding of humor, but it does not directly address our focal question of what makes things humorous. Thus, we focus on the other two constructs related to humor: comedy and humor appreciation

Other researchers describe humor as a stimulus that amuses or is intended to amuse people (Attardo & Raskin, 1991; Martin & Ford, 2018). We refer to things that elicit or are intended to elicit laughter, amusement, or the perception that something is funny as *comedy* (see Stern, 1996), and when comedy succeeds in amusing its audience, we describe it as being *humorous*. Comedy includes a wide range of stimuli: stories, cartoons, eye rolls, tickle attacks, and of course, jokes. Comedy can be intentional, such as when a person makes a sarcastic quip (e.g., "Walk much?"), or unintentional (e.g., *The Room*, which is widely considered the worst film ever made; Martin & Ford, 2018; Wyer & Collins, 1992). Importantly, not all comedy elicits humor appreciation. Stand-up comedians struggle for years to build a repertoire of jokes that evoke laughs (e.g., Rodney Dangerfield, Rickey Gervais), high-budget films routinely fail to amuse moviegoers (e.g., Dumb and Dumber To), and attempts to be funny may fall flat (e.g., most "dad jokes") or elicit outrage (Beard, 2008; Bitterly et al., 2017).

Table 1. Definitions and Examples of Constructs Related to Humor.

Construct	Definition	Examples (counter examples)
Sense of humor	Stable individual differences in the extent to or manner in which people produce comedy and appreciate humor	Some people laugh more than others. Professional comedians are better than most psychologists at making people laugh
Comedy		
Successful comedy	A stimulus that elicits humor appreciation	A film that is supposed to be funny that makes viewers laugh and feel amused
Failed comedy	A stimulus that is intended to elicit humor appreciation but that fails to trigger laughter, amusement, or perceived funniness	A film that is supposed to be funny that does not make the audience laugh or feel amused
Unintentional comedy	A stimulus that is not meant to be funny that accidentally elicits humor appreciation	A film that is supposed to be frightening but that viewers think is funny instead
Humor appreciation	A subjective, psychological response characterized by amusement, the tendency to laugh, and the perception that something is funny	A person laughs at a joke. A filmgoer thinks that a movie is funny. A child is amused by a song
Antecedent conditions		
Surprise	Perceiving something different than what you expect, given the situation and your knowledge of it	A snowstorm in Florida (vs. a snowstorm in Colorado). Winning the lottery (vs. winning a participation trophy)
Simultaneity	Holding conflicting interpretations, ideas, or beliefs at the same time	Thinking licorice is both delicious and disgusting (vs. thinking licorice is only disgusting). Winning the lottery and dying the next day (vs. winning the lottery and living)
Superiority	Feeling that you are better than someone or something else	Winning a competition (vs. losing a competition). Seeing someone else get hurt (vs. getting hurt yourself)
Violation appraisal	Perceiving something that threatens your beliefs about how things *should* be	Losing a competition (vs. winning a competition). A spelling mistake (vs. conventional spelling)
Benign appraisal	Perceiving that a stimulus or situation does not present a serious problem	A minor wound (vs. a deadly injury). A spelling mistake on Twitter (vs. a spelling mistake in PSPR)

Researchers also describe humor as a subjective psychological response to a comedic stimulus. Consistent with this meaning of humor, we use the term *humor appreciation* to refer to a psychological state characterized by amusement (or mirth), the perception that something is funny, and the tendency to laugh (McGraw & Warren, 2010; Ruch, 2008; Wyer & Collins, 1992). Laughter, the behavioral component of humor appreciation, refers to a distinct, repetitive and universally recognized vocal pattern involving sounds like "hahaha," "hehehehe," "hyuk hyuk," or, in some cases, "gyuh gyuh gyuh," (Martin & Ford, 2018; Provine, 2004). The perception that a stimulus is funny, the cognitive component of humor appreciation, refers to a judgment or conscious recognition that something is amusing. Finally, amusement,[1] the emotional component of humor appreciation, is an affective response characterized by positive valence and high arousal (Gross & Levenson, 1997). As amusement is part of humor appreciation, humor appreciation necessarily includes a positive and arousing affective experience. We mention this because several humor theories describe arousal as an antecedent of humor appreciation (e.g., Berlyne, 1972; Rothbart, 1976). Although humor appreciation does involve arousal, we conceptualize arousal as a feature rather than a cause.

Humor appreciation exists on a continuum. A greater intensity of either laughter, amusement, or perceived funniness indicates a greater degree of humor appreciation. An audience member who is intensely amused by a comedian's joke, for example, experiences more humor appreciation than an audience member who is only mildly amused, just as a filmgoer who laughs, feels amused, and thinks a movie is funny experiences more humor appreciation than a viewer who thinks the movie is funny but does not laugh. The emotional, cognitive, and behavioral components of humor appreciation tend to co-occur (Fuller & Sheehy-Skeffington, 1974; Herring et al., 2011; Ruch, 1997; Yamao et al., 2015). Yet, due to social influences and impression management, people sometimes laugh without finding something amusing (i.e., unvoiced, voluntary, or non-Duchenne laughter) or find something amusing without laughing (Bachorowski & Owren, 2001; G. A. Bryant et al., 2018; Provine, 2001; Ruch & Ekman, 2001).

The purpose of our review is to reveal when comedy (intentional or unintentional) evokes humor appreciation (laughter, amusement, and/or perceived funniness) and when it does not.

What Are the Antecedents of Successful Comedy?

What conditions explain when people appreciate humor and when they do not? Humor theories have attempted to answer

this question by specifying a mix of ingredients (i.e., antecedent conditions) whose combination ostensibly results in laughter, amusement, and the perception that something is funny.

By our count, the literature reveals more than 20 distinct theories that attempt to explain all instances of humor appreciation (see Table 2).[2] Reviews of the literature group these theories into three categories: superiority, incongruity, and relief (Gulas & Weinberger, 2006; Lynch, 2002; Monro, 1988; Morreall, 2009). Superiority theories suggest a link between humor appreciation and aggression, incongruity theories suggest a link between humor appreciation and a cognitive mismatch, and relief theories suggest a link between humor appreciation and a reduction in arousal or tension (Martin & Ford, 2018). These three categories, however, obscure the fact that there are multiple versions of superiority theory, incongruity theory, and relief theory, and each version prescribes a different mix of antecedents for successful comedy (Keith-Spiegel, 1972; Martin & Ford, 2018). Another problem with the superiority, incongruity, and relief trichotomy is that the categories are incomplete; newer theories do not clearly fit. Thus, we treat each theory as distinct rather than attempt to group them into one of these three categories.

Which of these 20+ theories most accurately explains the necessary and sufficient antecedents for humor appreciation? Evaluating humor theories is a challenge because they specify more than 20 distinct combinations of ingredients for successful comedy. For example, Gruner's (1997) version of superiority theory argues that people perceive humor when they feel that someone else is inferior to them (antecedent 1) and they are surprised (antecedent 2) in a playful context (antecedent 3). Spencer's (1860) version of relief theory, contends that humor occurs when nervous energy (antecedent 1) is released (antecedent 2) because a person perceives a "descending incongruity" (antecedent 3; i.e., a situation that is less serious, important, or dignified than it initially seemed).

A second challenge with evaluating humor theories is the literature suffers from the "jingle" and "jangle" fallacies (Block, 2000). Theories often use different labels to describe the same antecedent condition (i.e., the jangle fallacy). For example, some theories call simultaneity, the label we use to describe simultaneously holding conflicting ideas, "incongruity" (e.g., Bergson et al., 1911; Oring, 1992), whereas others call this antecedent "bisociation" (Koestler, 1964), "synergy" (Wyer & Collins, 1992), "juxtaposition" (Warren & McGraw, 2016a), "recursive elaboration" (Nomura & Maruno, 2008), a "cognitive shift" (Latta, 2011), or a "conceptual shift" (Morreall, 1983). Further complicating the task, different theories sometimes use the same label to describe conceptually different antecedents (i.e., the jingle fallacy). For example, "incongruity" has been used to describe perceiving something that is unexpected, perceiving something that is threatening, or simultaneously holding conflicting ideas (Martin & Ford, 2018; Warren & McGraw, 2016a).

How can we evaluate more than 20 different theories, each of which proposes multiple antecedents and often uses different names to describe the same antecedents? Our approach is to break each theory into its component ingredients and evaluate the extent to which each antecedent is present when people appreciate humor and absent when they do not. Although there are many humor theories, most leverage a subset of five common ingredients: surprise, simultaneity, superiority, a violation appraisal, and conditions that facilitate a benign appraisal.

If an antecedent accurately explains humor appreciation, then it should be present any time people laugh, feel amused, and find something funny, but absent whenever people do not appreciate humor. To find a consensus view, we test each antecedent against the following criteria: (a) is there evidence that humor appreciation is more likely to be present when the antecedent condition is present, and (b) is there evidence that humor appreciation is less likely to be present when the antecedent condition is absent. Antecedents can fail to explain humor appreciation because they are too narrow, in that people appreciate humor even when the antecedent is absent. That is, the antecedent can fail to be a necessary condition for humor appreciation. Antecedents can also fail because they are too broad, in that the antecedent is present even when humor appreciation is absent. That is, the antecedent can fail to be a sufficient condition. In the subsequent sections, we examine whether the data from existing studies suggest that each antecedent helps, is too narrow, or is too broad to explain humor appreciation.

One advantage of evaluating individual antecedents rather than entire theories is that discussing antecedents highlights similarities across theories that the literature often treats as being distinct. A second advantage is that it is more efficient to evaluate five antecedents than 20+ theories. A third advantage is that it is more feasible to assess whether empirical evidence is consistent or inconsistent with a specific antecedent than it is to assess whether the evidence supports or refutes a multifaceted theory. For example, many studies have investigated the relationship between amusement and surprise, but few (if any) have investigated the relationship between amusement and the combination of superiority, playfulness, and surprise (the three ingredients in Gruner's, 1997 superiority theory).

The next five sections sequentially define and explain each of the five antecedent conditions—surprise, simultaneity, superiority, violation appraisal, and a benign appraisal—that recur across humor theories. We review the different terms that the literature uses for each of these antecedent conditions and review the evidence from prior literature to assess which best differentiate stimuli that elicit humor appreciation from stimuli that do not. Note that we conceptualize each of these antecedents as an appraisal, or something that happens inside the head of a person, rather than a property of comedy itself.

Table 2. General Humor Theories and the Antecedent Conditions They Prescribe.

Ingredient→ Theory ↓	Surprise	Simultaneity	Superiority	Violation	Benign	Other
Superiority theories						
Superiority Theory Hobbes (1640/1999), Rapp (1949, 1951), and Gruner (1997)	Surprise, suddenness		Superiority, aggression, victory, hostility, disparagement		Social or temporal distance, playful	
Misattribution Theory Zillman and Bryant (1980)	Incongruity, novelty, surprise		Disparagement of a disliked entity		Misattribution	
Relief theories						
Relief Theory Spencer (1860)				Descending incongruity	Relief	Nervous energy
Psychoanalytic/Motivational Theory Freud (1928) and Kuhlman (1985)				Tendentious elements, repressed drives	Jokework	Nervous energy
Optimal Arousal Berlyne (1960, 1972)						Arousal + arousal-reduction
Arousal-Safety Rothbart (1976)	Incongruity				Playful, nonthreatening	
Incongruity theories						
Classic Incongruity Theories Schopenhauer (1819/1969), Nerhardt (1970), and Kant (1790/1987)	Incongruity	Incongruity				
Benign Incongruity Theories Guthrie (1903), Willmann (1940), and Gervais and Wilson (2005)	Incongruity				Benign, "alright", playful, distance	Social
Bergson's Incongruity Theory Bergson et al. (1911)		Incongruity	Faults of others			"mechanical encrusted on the living"
Bisociation Theory Koestler (1964)		Bisociation	Aggression			
Psychological Shift Morreall (1982)	Incongruity	Conceptual shift			Pleasant	
Incongruity-resolution Theories Goldstein et al. (1972), Suls (1972), and Shultz (1972),	Incongruity				Resolution playful context	
Appropriate Incongruity Theory Oring (1992)		Incongruity			Appropriate	
Other general humor theories						
McDougall's Laughter Theory McDougall (1922)				Maladjustment, inappropriate	Social distance	
Reversal theory Apter (1982) and Wyer and Collins (1992)		Synergy		Diminishment, devaluation	Playful mindset, paratelic state, protective frame	
False Alarm Theory Hayworth (1928) and Ramachandran (1998)				Threat, alarm	Safety, not real	
Benign Violation Theory Veatch (1998) and Warren and McGraw (2016a)		Simultaneity, juxtaposition		Violation	Normal, benign	
Theory L Latta (1999)		Cognitive shift			Relaxation	"Unrelaxation"
Ontic-Epistemic Theory Marteinson (2006)				Epistemological problem		
Dynamical Comprehension-elaboration Theory Nomura and Maruno (2008, 2011)	Sentient incongruity	Recursive elaboration				
Encryption Theory Flamson and Barrett (2008)					Understanding	Shared beliefs
Detection of Mistaken Reasoning Hurley et al. (2011)		Perceived as both "true" and "false"		Mistake	Harmless/trivial	

Surprise, for example, is a reaction that a person may or may not have when she sees a fish fly or hears a dog purr. This approach is consistent with most psychological theories but differs from linguistic and computational theories, which focus on properties of the comedic stimuli (typically verbal text; e.g., Attardo & Raskin, 1991; Binsted & Ritchie, 1997; Raskin et al., 2009).

Surprise

Philosopher Blaise Pascal wrote, "Nothing produces laughter more than a surprising disproportion between that which one expects and that which one sees" (as cited in Morreall, 1982, p. 245). Surprise, defined as a perception that diverges from or clashes with expectations or an established cognitive schema, is an ingredient in numerous humor theories (Gruner, 1997; McGhee, 1979; Pien & Rothbart, 1977; Suls, 1972). Many theories call surprise "incongruity" to denote an incongruity between what a person observes and what they expected (Shultz, 1976; Suls, 1972). We use the term surprise rather than incongruity because other researchers define incongruity as simultaneity or a violation appraisal (Eysenck, 1942; Martin & Ford, 2018; Warren & McGraw, 2016a).

Evidence that surprise is an antecedent. Support that surprise is an antecedent of humor appreciation comes from the observation that many humorous things (jokes, stories, films, etc.) are unexpected. For certain jokes, people who read a joke multiple times during an experiment rated the joke as being less funny after multiple repetitions (Hollingworth, 1911). Similarly, when people read a series of jokes, they rated jokes as being funnier when the jokes were less similar to jokes that they had previously read (Forabosco, 1994). Studies using the "weight judgment paradigm" also ostensibly support the view that surprise drives humor (Deckers, 1993; Nerhardt, 1970). In this paradigm, participants lift a series of weights that look the same. The study sets expectations by having participants initially lift similar weights before giving them a weight that is either heavier or lighter than the previous weights. These studies find that participants laugh more when the new weight is more discrepant from the initial weights, and thus more of a surprise (Deckers, 1993; Nerhardt, 1970).

Studies on the perceived funniness of words, and nonwords, similarly suggest that surprise plays a role in humor appreciation. Real words were perceived to be funnier when they are used less frequently and rely on less common letter combinations, which suggests that surprising words are more humorous, at least when the words are presented alone (Westbury & Hollis, 2019). Comparably, nonwords, letter strings that resemble words but that are not in a formal dictionary, were rated as being funnier when they were less similar to real words (Westbury et al., 2016). Finally, advertising studies report that humorous ads are more likely to include surprising content than nonhumorous ads (Alden et al., 2000) and elicit surprise immediately before eliciting momentary feelings of amusement (Woltman-Elpers et al., 2004).

Limitations of studies supporting surprise. There are at least three reasons why we suggest interpreting these results with caution. First, participants responded to only some of the surprising stimuli with more humor appreciation. Participants rated approximately one-third of the jokes in the Hollingworth (1911) study funnier *after* subsequent viewings. Analogously, although students were more likely to laugh when they picked up a surprising weight in the lab, train travelers who picked up a surprisingly heavy or light suitcase were not (Nerhardt, 1976).

Second, many of the studies rely on correlational data with inadequate experimental and statistical control. For example, Alden et al. (2000) and Woltman-Elpers et al. (2004) assessed the correlation between surprise and perceived funniness across and within different advertisements, respectively. Similarly, Westbury and colleagues assessed the correlation between surprising letter combinations and perceived humor in words (Westbury & Hollis, 2019) and nonwords (Westbury et al., 2016).

Third, the samples in the studies were limited in terms of size, cultural breadth, or both. Hollingworth (1911) relied on a sample of six Barnard students. Although subsequent studies used larger samples, they continued to rely almost exclusively on undergraduate students from western cultures, a limitation that they share with most humor research.

Evidence that surprise is both too narrow and too broad. Other studies, along with everyday observations, reveal that surprise does not always trigger humor appreciation. Surprising events, like getting mugged in broad daylight or contracting a sexually transmitted disease, yield negative emotions, like fear, sadness, disgust, or embarrassment, rather than amusement (Alden et al., 2000; Westbrook & Oliver, 1991). Thus, although many theories argue that surprise is a necessary ingredient for humor appreciation, few, if any, suggest that it is the only antecedent (Martin & Ford, 2018).

Despite the popularity of humor theories incorporating surprise as an antecedent, there is growing evidence that people experience humor appreciation even when they know what to expect. Anecdotally, consumers appear to be amused by favorite jokes and films after repeated viewings. Stand-up comedians receive laughs from "callbacks" by returning to a joke that they told before, and television shows often use "running gags" by repeating the same joke within or across different episodes. For example, writers of the cartoon South Park repeated the gag of killing the same character, Kenny, in 78 of the show's first 79 episodes. Presumably, viewers continued to find Kenny's death humorous even after they had learned to expect it.

Controlled studies similarly document contexts in which surprise *decreases* humor appreciation. Kenny (1955; no relation to the South Park character) asked one sample of participants to

report the extent to which punch lines in a sample of jokes were expected and a second sample to evaluate the extent to which they perceived the jokes to be funny. Jokes with expected punch lines were perceived to be funnier than more surprising jokes. Pollio and Mers (1974) found similar results in a study in which participants watched videos of stand-up routines by (prescandal) Bill Cosby and Phyllis Diller. The experimenter stopped the video before the comedians delivered the punch lines. Participants then guessed the punch line for each joke. The similarity between the participants' predictions and the actual punch lines was positively correlated with the funniness of the joke, as rated by a different group of participants. More recently, Topolinski (2014) found that participants rated jokes as being funnier if they had previously read part of the punch line earlier in the study than if the punch line was completely new. Prior exposure to part of the joke, which made it less surprising, caused the joke to seem funnier by making it easier to understand. Movies, too, continue to amuse viewers who rewatch the movie. Although most participants in an experiment predicted that they would enjoy watching a movie less when viewing it a second time, their enjoyment was equivalent to the first viewing (O'Brien, 2019; study 2). The study let participants watch any type of movie they liked, but this effect held even when analyzing just participants who chose to watch a comedy movie (O'Brien, personal communication, July 28, 2019).

In contrast to the widespread belief that "the secret to humor is surprise," data show that expected things are sometimes funny and surprising things are sometimes not funny. If surprise is not, in fact, a necessary ingredient, why are so many funny things surprising? There are two reasons. One, surprise increases physiological arousal (Fontaine et al., 2007; Russell, 1980), which is an integral part of humor appreciation, and when arousal is increased, people tend to experience greater humor appreciation (Martin & Ford, 2018). For example, people injected with epinephrine, which makes people feel aroused, experienced greater amusement and laughed more while watching a slapstick film than those injected with chlorpromazine, an autonomic blocking agent (Schachter & Wheeler, 1962). A second reason why most successful comedy is surprising could be because other key antecedents that trigger humor appreciation (e.g., simultaneity and a violation appraisal) are also typically surprising, which has led researchers to misattribute the effect to surprise. Next, we turn to one of these: simultaneity.

Simultaneity

At least 10 theories suggest that humor requires simultaneity, defined as holding contrasting perceptions, interpretations, or ideas at the same time (Attardo & Raskin, 1991; Bergson et al., 1911; Koestler, 1964; Veatch, 1998; Wyer & Collins, 1992). Consider the joke, "Did you hear about the guy whose left side was cut off? He's all right now." The punch line can be interpreted both to mean that the victim has recovered or that only the right side of his body remains (Martin & Ford, 2018). Simultaneity occurs when the audience holds the two interpretations, which are both possible despite being mutually incompatible, at once.

Simultaneity goes by a variety of labels, including incongruity (Eysenck, 1942; Kao et al., 2016; Schopenhauer, 1819/1969), bisociation (Koestler, 1964), synergy (Apter, 1982), script opposition (Raskin, 1985; Raskin et al., 2009), cognitive shift (Latta, 2011), recursive elaboration (Nomura & Maruno, 2008), and juxtaposition (Goel & Dolan, 2007; Warren & McGraw, 2016a). The jangle fallacy obscures the agreement among theories that perceiving conflicting ideas or interpretations is a key ingredient for successful comedy.

There is a large overlap between surprise and simultaneity because people do not typically expect to hold conflicting interpretations. This overlap is so strong that many theorists use a single term, incongruity, to describe both something that is unexpected and a contrast between conflicting interpretations (Martin & Ford, 2018; Parovel & Guidi, 2015). Simultaneity and surprise, however, are conceptually distinct (Martin & Ford, 2018; Warren & McGraw, 2016a). Winning the lottery may be unexpected even if the winner does not simultaneously hold an alternative interpretation of the event, whereas a surrealistic painting may trigger conflicting interpretations even in viewers who had previously seen the painting and knew what to expect. Thus, we evaluate simultaneity separately from surprise.

Evidence that simultaneity is an antecedent. Studies on scripted jokes, word pairs, moving shapes, tickling, and advertising suggest that simultaneity plays a role in humor appreciation. Linguists have studied humor by decoding the structural characteristics of written jokes, including the situation in which the joke occurs, the characters involved, the specific words used to tell the joke, and the presence of two normally incompatible scripts (which tend to evoke simultaneity). The presence of incompatible scripts, linguists suggest, is the most critical structural characteristic determining the joke's success (Attardo & Raskin, 1991; Gabora & Kitto, 2017; Ruch et al., 1993). Consider, again, the joke, "Did you hear about the guy whose left side was cut off? He's all right now." Changing the character from "guy" to "gal" does little to change the joke, but swapping the words "left" and "right" ruins the joke because it would eliminate simultaneity by offering a single interpretation: only the left side of the body remains (Ruch et al., 1993). Marketing researchers have argued that simultaneity plays a similar role in more complex comedic stimuli, including advertisements. A majority of humorous advertisements in the United States, Germany, Thailand, and Korea evoke contrasting interpretations, such as something being both actual and nonactual, expected and unexpected, or possible and impossible (Alden et al., 1993).

Studies investigating word pairs similarly suggest that stimuli associated with incompatible ideas (i.e., simultaneity) are more likely to evoke humor appreciation. Word pairs that combine concepts with less compatible meanings (e.g.,

"hot poet") were rated as funnier than word pairs that combine concepts with more compatible meanings (e.g., "happy child"; Godkewitsch, 1974; Hillson & Martin, 1994). Similarly, people have an easier time producing comedy by comparing words that evoke different topics (e.g., money and sex) than by comparing words that evoke similar topics (e.g., love and sex; Hillson & Martin, 1994). Presumably, it is easier to induce simultaneity by thinking about dissimilar, compared to similar, topics.

Other evidence that simultaneity precedes humor appreciation comes from a series of experiments in which participants view a two-dimensional square box that moves to the right across a computer screen until it hits a second square box (Parovel & Guidi, 2015). The experiments manipulate what happens when the boxes collide. In a no-simultaneity control condition, the second box moves to the right in a direct line; in a second condition, the box expands and contracts like a frog; and in a third condition, the box appears to jump up and down like a rabbit. Participants rated the box as being funnier when it resembled both a box and an animal (either the frog or the rabbit) than when it only looked like a box.

Studies in neuroscience provide further evidence for simultaneity by showing that humor appreciation involves brain areas associated with processing conflicting signals, including the temporo-occipital junction (TOJ) and the temporo-parietal junction (TPJ; Franklin & Adams, 2011; Vrticka et al., 2013). Amir and colleagues (2013) found higher levels of activation in the TOJ and TPJ brain regions when adult participants viewed images with humorous rather than nonhumorous captions. Children, similarly, showed higher levels of TOJ and TPJ activation while they watched humorous video clips than while they watched either neutral clips or positive but nonhumorous clips (Neely et al., 2012). Studies even find behavioral evidence of simultaneity during tickle attacks: people who are tickled show facial movements associated with both discomfort (e.g., grimaces) and pleasure (e.g., smiles; Harris & Alvarado, 2005).

Limitations with studies supporting simultaneity. Although the evidence that simultaneity is associated with humor appreciation is relatively consistent both across and within studies, many of these studies share similar methodological limitations as the studies that report a relationship between humor appreciation and surprise. Rather than directly manipulate simultaneity, most studies measured the correlation between perceived humor and a measure associated with simultaneity, such as the presence of opposing scripts (Alden et al., 1993), distance between semantic categories (Godkewitsch, 1974; Hillson & Martin, 1994), or activation in the TOJ or TPJ brain regions (Franklin & Adams, 2011). Other neuroimaging studies manipulated humor appreciation and measured brain activity associated with simultaneity (Amir et al., 2013; Neely et al., 2012). The few studies that attempted to manipulate simultaneity have other drawbacks. Parovel and Guidi (2015) rely on a small sample of both participants ($N = 15$) and stimuli (three events, two that are likely to evoke simultaneity and one that is not). Finally, Ruch et al. (1993) did not directly test whether simultaneity influences humor appreciation; they measured the perceived similarity between jokes rather than laughter, amusement, or perceived funniness.

Despite these methodological issues, evidence from empirical studies lead us to tentatively conclude that simultaneity is a necessary condition for humor appreciation. However, as we discuss next, simultaneity alone is insufficient to produce laughter and amusement.

Evidence that simultaneity is too broad. Some theories describe simultaneity as the only ingredient needed to evoke laughter and amusement (Dewitte & Verguts, 2001; Schopenhauer, 1819/1969), but most suggest that it is only one ingredient in a more complex recipe. Koestler (1964), for example, notes that scientific discovery and artwork typically require simultaneity yet are not humorous. An experiment by Warren and McGraw (2016a) similarly finds that people consider products that combine incompatible attributes (which likely evoke simultaneity) innovative rather than humorous when the attribute combination seems useful. For example, people thought that the first smartphone, which could be perceived as both a phone and a computer, was cool rather than funny (Warren & Reimann, 2019). It is also easy to identify stimuli evoking conflicting interpretations that seem strictly negative rather than humorous. People who detect a lie, for example, recognize that what a person said (interpretation 1) is not true (interpretation 2), but typically are not amused (Triezenberg, 2008). In sum, studies using a variety of methods and testing a variety of comedic stimuli are consistent with simultaneity being a necessary but not a sufficient condition for humor appreciation.

Superiority

One of the oldest humor theories suggests that the key ingredient is a feeling of triumph that comes from defeating an adversary (i.e., superiority). Hobbes (1640/1999) writes, "the passion of laughter is nothing else but sudden glory arising from a sudden conception of some eminence in ourselves by comparison with the infirmity of others, or with our own formerly." Gruner (1997), the most adamant contemporary supporter of superiority theory, echoes Hobbes arguing,

> we laugh at the misfortune, stupidity, clumsiness, moral or cultural defect, suddenly revealed in *someone else*, to whom we instantly and momentarily feel "superior" since *we* are *not*, at that moment, unfortunate, stupid, clumsy, morally or culturally defective, and so on. (p. 13, emphasis in original)

Proponents of superiority theory argue that humor and laughter developed through natural selection as an expression of victory in the evolutionary game of dominance (Alexander,

1986; Gruner, 1997). As society reduced opportunities to physically vanquish and overcome foes, humans began to laugh at smaller and more symbolic triumphs over others, like telling someone, "Yo mamma is so ugly, when she tried to join an ugly contest the judge said, 'Sorry, no professionals.'"

Evidence that superiority is an antecedent. Historically, onlookers would laugh at people being publicly tortured or executed (Provine, 2001), Nazi Gestapo soldiers would laugh at their prisoners (Lefcourt, 2001), and starving African tribesman would laugh at others who were suffering even more than they were (Turnbull, 1972). Today, playground bullies and internet trolls alike laugh at the suffering of their victims (Keltner et al., 2001; Schwartz, 2008), and some studies have found a significant correlation between aggression and humor appreciation in cartoons, such that cartoons in which characters are more severely insulted or injured are perceived to be funnier (Epstein & Smith, 1956; McCauley et al., 1983; Singer et al., 1967).

Limitations with studies supporting superiority. Most of the support for superiority comes from anecdotes and examples rather than systematic studies. The few studies that document a statistically significant relationship between superiority and humor appreciation test the relationship in a single domain (cartoons) and either rely on correlations (McCauley et al., 1983) or a small sample of cartoons that manipulate aggression (4 cartoons in each category; Singer et al., 1967) or hostility (16 cartoons in each category; Epstein & Smith, 1956). More to the point, follow-up research has revealed inconsistent evidence; studies find the relationship between aggression and perceived funniness is curvilinear (J. Bryant, 1977) or moderated by a variety of factors, such as whether the person viewing the comedy likes the victim (Burmeister & Carels, 2014; La Fave et al., 1976) and the extent to which the aggression seems justified (Deckers & Carr, 1986; Zillmann & Bryant, 1974).

Evidence that superiority is too narrow and too broad. Data from studies that do not rely on jokes or cartoons are inconsistent with superiority being a necessary ingredient in humor appreciation. If humor evolved as a response to superiority, then animals engaging in rough-and-tumble play should be more likely to laugh when they are "winning" or in the more dominant position. In contrast, apes engaging in rough-and-tumble play laugh more when being chased than when chasing (Matsusaka, 2004). Similarly, humans and nonhuman mammals are more likely to laugh when they are the victim rather than the perpetrator of a tickle attack (Provine, 2001). If feeling superior humor appreciation, then people should be more likely to laugh when they are in a high-status position than a low-status position. Observational studies, however, show the opposite pattern: people in social interactions with lower status (e.g., subordinate employees) tend to laugh more than people with higher status (e.g., bosses; Provine, 2001). More generally, it is easy to find instances of successful humor in adult humans that do not involve superiority (Hurley et al., 2011; Martin & Ford, 2018). For example, many people find puns, like the one used in John Deere's slogan, "Nothing runs like a Deere," humorous. It is difficult to see how a pun like this would cause a person to feel sudden glory or triumph over others (or a past version of herself).

In sum, data suggest that superiority is both too narrow and too broad to explain humor appreciation. People can feel superior to others without appreciating humor, just as they can appreciate humor without feeling superior. Although superiority may not itself explain humor, we suspect that it has endured because, like surprise, it is closely associated with another antecedent that does: a violation appraisal, which is where we turn next.

Violation Appraisal

Since the ancient Greeks, great thinkers have noted how humor is triggered by potentially threatening stimuli and negative situations. Plato associated humor with vice (Morreall, 2009), Aristotle viewed humor as "a subdivision of the ugly" (Provine, 2001), and Mark Twain (1897/2014) wrote, "The secret source of humor itself is not joy but sorrow." Humor theories suggest a range of negative antecedents of humor appreciation, including disparagement (Ferguson & Ford, 2008; Zillmann, 1983), releasing repressed sexual, aggressive, and other antisocial drives (Freud, 1928), reinterpreting an initial impression as less valued than it at first seemed (i.e., diminishment; Apter, 1982; Wyer & Collins, 1992), encountering an epistemological problem (Marteinson, 2006), and perceiving a threat (McGraw & Warren, 2010; Ramachandran, 1998). Even the words denoting humor have negative etymological roots. Funny originally described things that seemed strange or peculiar. Humor referred to blood, bile, and phlegm inside the body, and possessing humor meant that a person behaved strangely or was mentally unbalanced (Martin & Ford, 2018).

We use *violation appraisal*, defined as anything that subjectively threatens a person's well-being, identity, or normative belief structure (McGraw & Warren, 2010; Veatch, 1998; Warren & McGraw, 2016a), as an umbrella term designed to capture the many different negative stimuli and situations (i.e., violations) that the literature suggests evoke this appraisal.[3] Violations originated developmentally as threats to physical well-being, like the presence of an attacker. As the popularity of shows like *Jackass* and *America's Funniest Home Videos* attests, people continue to be amused by physical violations, such as a video of someone falling on his face. However, as humans evolved to develop a complex sense of self and systems of culture, language, and logic, there became many new ways in which they could be threatened. Adult humans hold a complex system of beliefs about their position in society and how others view them (i.e., their identity), how people should behave and interact with one another

(i.e., social and cultural norms), how people should communicate (i.e., linguistic and communication norms), and how things work and fit with one another (i.e., logic norms).

Thus, people appraise violations in not only physical threats but also identity threats (e.g., an embarrassing picture posted on Facebook) as well as behaviors that threaten different types of norms: cultural (e.g., wearing a pink tutu to a funeral); social (e.g., farting at the dinner table); conversational (e.g., a sarcastic greeting card); linguistic (e.g., the spelling of deer in the "Nothing runs like a Deere" slogan); and logical (e.g., a video showing a flying pig; McGraw & Warren, 2010; Veatch, 1998). The "threat" in a violation can be quite mild, such as breaking a linguistic convention to create a pun or an awkward pause during a conversation. However, to be appraised as a violation, something must differ from a person's subjective view of how things *should be*, not merely differ from their sense of how things typically *are* (Veatch, 1998; Warren & McGraw, 2016a).

Evidence that violation appraisal is an antecedent. Data from a range of studies suggest that a violation appraisal is an important antecedent of humor appreciation. Most of the laughter in nonhuman mammals occurs during potentially threatening social encounters, like tickling, wrestling, and chasing games (Gervais & Wilson, 2005; Matsusaka, 2004; Vettin & Todt, 2005). Humans similarly appreciate humor in response to a range of potentially threatening stimuli. They tend to think that jokes are funnier when they include taboo themes, including sex and violence (Kuhlman, 1985). Metaphors evoke more humor appreciation when they unfavorably compare a high-status entity to a low-status entity rather than vice versa. For example, participants rated "My surgeon is a butcher among doctors" as being funnier than "My butcher is a surgeon among meat cutters" (Mio & Graesser, 1991). Similarly, a computer program that attempted to create funny one-line phrases (e.g., "which part of town would you be in?") by changing one of the words in the phrase was more successful when the new word was considered taboo (e.g., *fart* instead of *part*) rather than nontaboo (e.g., *cart* instead of *part*; Valitutti et al., 2016). Verbal statements likewise trigger higher levels of perceived humor when they are illogical (e.g., "a pig with impeccable table manners") or threatening (e.g., "a donkey that kicks below the belt") rather than logical and nonthreatening (e.g., "a cow that eats grass"; Purzycki, 2011). Nonwords are perceived to be funnier when they resemble words considered inappropriate for polite conversation ("shart," "fcuk"; Westbury et al., 2016). Similarly, real words tend to be funnier when they denote insults (e.g., "floozy," "buffoon"), expletives (e.g., "hogwash," "fuck"), body parts (e.g., "taint," "booty"), or body functions (e.g., "burp," "turd"; Engelthaler & Hills, 2018; Westbury & Hollis, 2019),[4] all of which are demeaning, inappropriate, or at least uncomfortable when they occur during polite conversation.

Violation appraisal versus surprise. In most contexts, violations are unexpected. The natural correlation between surprise and a violation appraisal may explain why theories describe surprise as a necessary condition for humor appreciation. Surprise and a violation appraisal, however, are distinct constructs. Violation appraisals require something that seems wrong or negative, not merely surprising. Unanticipated blessings, such as winning the lottery or discovering a cure for pancreatic cancer, are surprising but not violating. Conversely, violations are sometimes expected. American Idol viewers expect rude comments from notoriously critical host Simon Cowell, just as Texans expect August to be uncomfortably hot.

Studies by Warren and McGraw (2016a) attempted to empirically tease apart the effects of surprise from the effects of a violation appraisal by crossing whether participants were exposed to a violation with whether they were exposed to something unexpected. In one study, participants viewed a video of an athlete pole vaulting. In the no-violation-condition, the video showed a successful pole vault; whereas in the violation-condition, the video showed the pole breaking and the athlete crashing on to the mat. Before watching the video, however, participants were told either to expect a successful pole vault or to expect the pole to break. The results were consistent with the hypothesis that a violation appraisal, rather than surprise, drives humor appreciation. Participants found the video of the pole breaking more humorous than the successful pole vault, even when they were told that the pole would break and, consequently, expected to observe the violation. In a different experiment, a confederate either offered unsuspecting participants a bowl of Skittles (no violation) or threw the Skittles at the participant (a violation). Orthogonally, the confederate performed this behavior either unexpectedly or after warning the participant beforehand. Consistent with the prediction that a violation appraisal drives humor appreciation, participants were more likely to laugh when the confederate threw the candy at them than when they offered it to them. Inconsistent with the prediction that surprise drives humor appreciation, participants were less likely to laugh when the candy was unexpectedly thrown than when they had been warned about the candy throwing beforehand. These studies show that when surprising and violating stimuli are orthogonally manipulated, violations increase humor appreciation; surprise does not.

Violation appraisal versus superiority. In most cases, the conditions that lead to feelings of superiority (i.e., something bad happening to someone else) will also be appraised as violations. Seeing someone step on a rake, for example, is both likely to hurt the rake-stepper (i.e., a physical violation) and could make you feel superior to him. The natural correlation between superiority and a violation appraisal may explain why several theories describe superiority as a necessary condition for humor appreciation. One critical difference between these ingredients, however, occurs when a person is the victim of an insult or attack, in which case, the victim would appraise a violation but would not feel

superior. As previously noted, the literature shows that apes and humans tend to laugh more not when they are the aggressor, but when they are on the receiving end of a chasing game, play fight, or tickle attack (Matsusaka, 2004; Provine, 2001). Data from cartoon studies similarly suggests that a violation appraisal explains more variance in humor appreciation than superiority. Deckers and Carr (1986) measured both the extent to which the antagonist in a cartoon was aggressive, which is a closer proxy for superiority, and the pain experienced by the victim, which is a closer proxy for a violation appraisal. The two measures were correlated, but there were examples of cartoons that showed more aggression (e.g., a dog using a voodoo doll to injure the mailman) and others that showed more pain (e.g., a cowboy burnt from trying to "ride into the sunset"). The measure of pain, but not the measure of superiority, significantly predicted the perceived funniness of the cartoons.

Limitations with studies supporting a violation appraisal. Most of the studies showing a relationship between a violation appraisal and humor appreciation have one of three limitations. Some studies did not set out to test a relationship between a violation appraisal and humor appreciation and, consequently, do not provide a statistical test of this relationship (Matsusaka, 2004; Westbury et al., 2016; Westbury & Hollis, 2019). Other studies measured, but did not manipulate, a violation appraisal (e.g., Deckers & Carr, 1986; Kuhlman, 1985; Vettin & Todt, 2005; studies 3–5 in Warren & McGraw, 2016a). Finally, a third group of studies relied on a limited range of stimuli, such as puns (Valitutti et al., 2016), analogies (Mio & Graesser, 1991), simple verbal statements (Purzycki, 2011), an athletic feat (studies 1a, 1b in Warren & McGraw, 2016a) or a scripted social interaction (study 6 in Warren & McGraw, 2016a). Although each individual study is limited, collectively we believe that they provide convincing support that a violation appraisal is a necessary condition for humor appreciation.

Evidence that a violation appraisal is too broad. Most bad things, such as getting a flat tire or choking on a piece of steak, are not humorous. Classic manipulations in experimental psychology that administer violations, for example, by shocking participants with electric currents (e.g., Cacioppo et al., 1992) or excluding them in a computerized ball-tossing game (e.g., Eisenberger et al., 2003), evoke negative responses but rarely (if ever) make participants laugh or feel amused. Similarly, experiments that compare the appraisals evoked by humorous compared to nonhumorous tragic and frightening videos show that participants appraise violations in tragic and frightening videos as frequently as they appraise violations in humorous videos (Warren & McGraw, 2016a).

Thus, data from studies complement anecdotal examples to suggest that a violation appraisal is a necessary ingredient in humor appreciation, but it alone does not explain what makes things funny. The next section discusses an additional condition, a benign appraisal, that helps explain when violation appraisals trigger humor appreciation.

Benign Appraisal

Most theories recognize that the aforementioned ingredients are not enough to distinguish successful from failed comedy. They suggest that humor appreciation additionally requires a stimulus or situation to seem benign. A benign appraisal refers to the subjective perception that something is sensible, acceptable, harmless, or okay. Most humor theories do not explicitly name a benign appraisal as an antecedent condition. They instead have proposed a handful of conditions that make people more likely to arrive at a benign appraisal, including: resolution, applying an alternative norm, misattribution, safety, a playful state, psychological distance, and low commitment. Although these conditions are conceptually distinct (i.e., resolution is not the same as misattribution or safety), each shares an important similarity: they make it easier for a person to appraise a stimulus or situation as benign. Thus, we treat a benign appraisal as a more abstract and inclusive condition that binds resolution, an alternative norm, misattribution, a playful motivational state, safety, distance, and low commitment into a single antecedent of humor appreciation.

As this section discusses a variety of antecedent conditions, which we argue all facilitate a benign appraisal, rather than a single condition, we organize it differently from the previous sections on surprise, simultaneity, superiority, and violation appraisal. We discuss how factors related to the (a) psychological processes (resolution, applying an alternative norm, and misattribution) that people use to interpret a comedic stimulus, (b) the situation in which they encounter the stimulus (safety and playful state), and (c) the relationship between the person and the stimulus (psychological distance and commitment) can each independently facilitate a benign appraisal and tend to increase humor appreciation. We conclude by integrating the evidence related to each of these factors to suggest that people appreciate humor only when they appraise a comedic stimulus as being benign, although the reason for the benign appraisal—in other words, whether it is caused by resolution or misattribution or distance or another factor—is inconsequential so long as the situation or stimulus seems benign.

Resolution. Resolution refers to the process of making sense of something that initially seems illogical, misleading, or incorrect. Consider the joke: *Why do gorillas have big nostrils? Because they have big fingers!* The otherwise illogical relationship between finger and nostril size can be resolved by recognizing that gorillas are notorious nose pickers. Resolution facilitates a benign appraisal by revealing how something that initially appeared to be illogical or incorrect is actually sensible or appropriate (Ludden et al., 2012; Oring, 2011).

One of the most popular and influential humor theories, incongruity-resolution, argues that humor appreciation occurs when a person is able to explain or make sense of something unexpected (Shultz, 1974; Suls, 1972; Woltman-Elpers et al., 2004). Research finds that resolution tends to increase the humor perceived in scripted jokes, at least for adults and older children (Alden et al., 2000; Suls, 1972). Shultz and colleagues (Schultz & Horibe, 1974; Shultz, 1974) created three versions of different jokes: one in which something unexpected or illogical is later resolved (resolved incongruity), one in which something unexpected or illogical is not resolved (unresolved incongruity), and one in which everything seems expected or logical (no incongruity). For example, the resolved incongruity version of one of the jokes was as follows:

Mother: "Doctor, come at once! Our baby swallowed a fountain pen!"
Doctor: "I'll be right over. What are you doing in the meantime?"
Mother: "Using a pencil."

The response "using a pencil" is an unexpected way for the mother to respond,[5] but it makes sense if the reader recognizes that the doctor's question could mean, "what are you doing about the pen that is no longer accessible?" rather than "what are you doing about the baby's health?" In the no-incongruity version, the researchers changed the mother's response to "We don't know what to do." In the unresolved incongruity version, the baby swallows a rubber band rather than a fountain pen; thus, there is no interpretation of the doctor's question that makes sense of the mother's response, "using a pencil." Adults and older children perceived more humor in the resolved incongruity versions of the jokes than the unresolved incongruity versions. The no-incongruity versions of the jokes elicited the least humor appreciation.

Resolution is most frequently evoked as an explanation for humor in canned jokes (i.e., set-up then punch line), but it can be defined as any alternative explanation capable of justifying, explaining, or legitimizing something that seems surprising, illogical, or wrong. Hillson and Martin (1994) found evidence that the ability to resolve, or make sense of, metaphors helps explain why some metaphors are more humorous than others. Specifically, the authors found that metaphors combining nouns from dissimilar domains (e.g., actors and food) were funnier when the nouns shared other similarities. For example, the metaphor, "Woody Allen is the *quiche* of actors" was more humorous than, "Woody Allen is the *steak and potatoes* of actors," because participants had an easier time associating Woody Allen with quiche than with steak and potatoes. Advertising research similarly documents a link between the ease of resolving advertising content and the extent to which the ad is perceived to be funny (Alden et al., 2000; Flaherty et al., 2004).

Alternative norm. A related reason that a behavior can be appraised as benign is that it seems correct, acceptable, or appropriate according to an alternative norm (McGraw & Warren, 2010; Veatch, 1998). Most puns, for example, violate one language norm while conforming to a second norm. Consider the one-liner: "R.I.P. boiling water; you will be mist." Although "missed" is incorrectly spelled as "mist," this alternative spelling is also the correct spelling of another word that fits within the sentence. Stimuli considered to be unusual, insulting, or wrong are funnier when they also seem appropriate according to an alternative norm (Oring, 1992; Veatch, 1998). For example, a story about a taboo sexual behavior (a man who uses his pet kitten to masturbate) was more likely to amuse readers if the behavior adhered to an alternative moral norm (e.g., "the kitten purrs and seems to enjoy the contact") than if it seemed unambiguously wrong (e.g., "the kitten whines and does not seem to enjoy the contact"; McGraw & Warren, 2010). Other studies find that insult humor is perceived to be funnier when the insult seems warranted because the victim deserves it (Gutman & Priest, 1969). Violent ads are more likely to amuse viewers who consider violence more normal, just as insult humor is more likely to amuse people when the insult is acceptable according to the group's social norms (Gutiérrez et al., 2018). For example, sexist jokes are more likely to succeed at a comedy club, where it is normal to make fun of everyone, than at work, where sexist insults are seen as a form of harassment (Gray & Ford, 2013).

Misattribution. Psychoanalytic and disparagement theories, which describe humor as a response to demeaning, aggressive, sexual, or otherwise taboo behaviors, suggest that these violations are more humorous if the source of humor is misattributed to something socially acceptable. Freud (1928), for example, argued that jokes contain linguistic or logical tricks (i.e., joke-work) that disguise the antisocial aspects of the joke thereby allowing the audience to appreciate humor. Misattribution facilitates a benign appraisal by helping people think that they are laughing at something acceptable or appropriate. Consider the joke: "Two cannibals are eating a clown. One says to the other, 'Does this taste funny to you?'" Rather than attribute the humor to the taboo behavior (cannibalism), people can instead attribute it to the double meaning of the phrase "does this taste funny." Studies by Zillmann and Bryant (1980) illustrate how misattribution can increase humor. Participants in an experiment laughed more in a condition where an experimenter who had been rude to them accidentally spilled a hot cup of tea on herself if a jack-in-the-box suddenly popped out of a box than if the same tea spill was not accompanied by a jack-coming-out-of-the-box. Although participants were amused by the rude experimenter spilling tea on herself, their humor appreciation became socially acceptable (i.e., benign) when they could attribute it to the unusual occurrence (i.e., the jack-in-the-box) rather than the misfortune itself.

Playful State. Some scholars describe humor as a type of play (Eastman, 1937; Fry, 2017; McGhee, 1996). Play refers to a state in which people are disinterested in things that otherwise seem serious; Apter (1982) refers to this as a "paratelic state," in which people are concerned with immediate pleasure rather than long-term goals. A paratelic (i.e., playful) state facilitates a benign appraisal by helping people feel psychologically removed from pressing concerns (Apter, 1982). Studies in etymology, psychology, and advertising illustrate how contexts or cues that activate a playful state tend to increase humor appreciation. As previously noted, animal laughter occurs primarily during playful activities, including chasing games, tickling, and mock fighting (Gervais & Wilson, 2005; Panksepp & Burgdorf, 2003; Provine, 2001). Analogously, experimental participants perceive more humor in jokes when they read the joke in a nonserious state rather than a serious, goal-directed state (Wyer & Collins, 1992). Advertising studies likewise find that ads containing playful cues, such as happy music or animated frogs, are considered more humorous than ads that lack playful cues (Alden et al., 2000). Laughter itself can be a playful cue, and television viewers rate shows that include laugh-tracks as being funnier (Gillespie et al., 2016). More support for the link between play and humor appreciation comes from personality studies, which find that measures of "need for play" and "playful attitude" correlate significantly with scales measuring sense of humor (Müller & Ruch, 2011; Proyer & Ruch, 2011; Ruch & Heintz, 2013). Conversely, scores on the "Telic Dominance Scale," which measures whether people tend to be in a serious rather than a playful state, are negatively correlated with sense of humor (Martin, 1984).

Safety. Arousal-safety (Rothbart, 1977) and false-alarm (Ramachandran, 1998) theories suggest that making a person feel safe can make otherwise threatening stimuli funny. Safety facilitates a benign appraisal by reducing the risk of damage or harm. Whereas the prospect of being assaulted with a dangerous weapon, like a machete, would be terrifying, the prospect of being assaulted with a safe, harmless object, like a feather or a wet noodle, might be humorous. In a classic study conducted by Shurcliff (1968), participants who thought that they would be extracting blood from a live rat laughed and showed amusement when they discovered that the rat was a toy. Similarly, the approach of a masked adult tended to frighten small children when the adult was a stranger, but amuse the children when the adult was a parent, presumably because the child felt safer when approached by a parent (Rothbart, 1973; Sroufe & Wunsch, 1972).

Psychological distance. Psychological distance refers to the extent to which a stimulus feels close or far away spatially (i.e., here vs. there), temporally (i.e., now vs. then), socially (i.e., self vs. other), or hypothetically (i.e., real vs. imagined; Liberman & Trope, 2008; Van Boven et al., 2010). Psychological distance reduces the threat from otherwise aversive experiences (Mobbs et al., 2007; Williams & Bargh, 2008). A poisonous cocktail is less dangerous when it is served to a character in a movie than when you are holding it in your hand. Like safety, psychological distance makes it easier to perceive otherwise negative stimuli as benign (McGraw et al., 2012).

Distance can transform negative experiences into amusing ones (McGraw & Warren, 2010; Morreall, 2009). Social distance from an insult increases the humor perceived in disparaging jokes. Although misogynistic jokes tend to upset women, they often elicit humor appreciation in men whose gender identities are not directly insulted (Wolff et al., 1934). Analogously, the stronger a woman's gender identity, the more amused they are by jokes disparaging men (e.g., "What do UFOs and smart men have in common? You keep hearing about them but never see them"), but are less amused by jokes disparaging women (Abrams et al., 2015). Studies similarly show that people experience more humor in highly aversive experiences, like losing a lot of money or getting hit by a car, when the incidents occurred in the distant past, victimized strangers, were hypothetical, and appeared to be farther away (McGraw et al., 2012). Likewise, disgusting experiences, including a story in which a man has sex with a chicken carcass and a movie scene in which a woman eats feces, are more amusing when people are primed to feel further from rather than closer to the experience (Hemenover & Schimmack, 2007; McGraw & Warren, 2010). Relatedly, power, which makes people feel more distant from others (Lammers et al., 2012), increases the extent to which people are amused by disparaging jokes (Knegtmans et al., 2018). After writing about a time in which they had power over others, participants were more amused by insulting jokes because they rated the jokes as being more appropriate compared to participants who did not feel powerful (Knegtmans et al., 2018). To butcher a quote variously attributed to Mark Twain, Carol Burnett, Lenny Bruce, and Steve Allen: research suggests that "comedy is tragedy plus temporal, social, spatial, or hypothetical distance."

Low commitment. Commitment refers to the extent to which a person cares about another person or a norm. Highly committed people are psychologically invested in the well-being of others or the sanctity of a norm. Consequently, it is easier for people to appraise a behavior that threatens a person or breaks a norm as benign if they are less committed to the violated person or norm (McGraw & Warren, 2010). Insulting ethnic jokes (e.g., "Did you hear about the winner of the Irish beauty contest? Me neither") are funnier to people who do not care about the disparaged group (e.g., the Irish; La Fave et al., 1976). Similarly, participants with unfavorable views of overweight people rate videos making fun of obesity as being funnier than participants who have a more favorable view of overweight people (Burmeister & Carels, 2014).

Other studies show that stronger commitment to a norm, such as the sanctity of Christianity, decreases the extent to

which people are amused when the norm is threatened. For example, Christians rated sacrilegious jokes as being less funny than atheists, even though Christians and atheists perceived similar levels of funniness in nonreligious jokes (Schweizer & Ott, 2016). Similarly, participants who regularly attend church were less likely than nonchurchgoers to be amused by a story in which a church that raffles off a Hummer to recruit new members (McGraw & Warren, 2010). In addition, survey respondents who reported being more prudish (i.e., committed to the belief that sex is a sin and should be repressed) rated jokes with sexual content as being less funny than less prudish respondents (Ruch & Hehl, 1988).

How do different ways of being benign influence humor appreciation? Resolution, multiple norms, misattribution, a playful state, safety, distance, and low commitment all facilitate humor appreciation in certain contexts; but none by itself appears to be necessary for humor appreciation. Laughter can occur in the absence of resolution (Nerhardt, 1970), psychological distance reduces the humor perceived in minor mishaps (McGraw et al., 2012), and a complete absence of commitment to a moral principle reduces the appreciation of jokes violating that principle (Kruschke & Vollmer, 2014). Why do each of these conditions increase humor appreciation even though none of them appear to be necessary? Our answer: because humor appreciation requires a general benign appraisal.

What best facilitates a benign appraisal likely depends on the type of comedic stimulus. For example, resolution appears to be a critical ingredient in canned jokes (Suls, 1972), psychological distance may be critical in slapstick (Morreall, 2009), and safety accompanied by a playful state may be critical in physical forms of humor such as tickling and rough-and-tumble play (Gervais & Wilson, 2005). Moreover, the conditions that facilitate a benign appraisal can substitute for one another. A failed skateboard trick may trigger immediate laughter from the skateboarder when he lands safely (despite the absence of psychological distance). However, the same failed trick may trigger laughter from psychologically distant YouTube viewers even when the skateboarder is badly hurt (despite the absence of safety).

In addition to making sense of why seemingly different conditions trigger humor appreciation, the conclusion that humor requires a benign appraisal is consistent with emerging research in physiology and positive psychology. Physiology studies document how laughter corresponds with motor inhibition and muscle weakness, changes associated with being in a benign environment (Overeem et al., 2004). Furthermore, emotion researchers contend that positive emotions require a benign appraisal (Fredrickson, 1998). Given that humor appreciation involves the positive emotion of amusement, it follows that it is experienced only when people appraise a stimulus or situation as being harmless, acceptable, sensible, or otherwise okay.

Finally, finding that humor appreciation requires a benign appraisal sheds new light on early ideas about the relationship between arousal and humor. Berlyne (1960, 1972) argued that moderate levels of arousal are rewarding, and consequently humorous, whereas high levels of arousal tend to be aversive. Benign appraisals are associated with reducing arousal (e.g., realizing something dangerous is actually safe), which may bring an unpleasant level of arousal generated by violations down to a more enjoyable (and humorous) level.

General Discussion and Takeaways

We reviewed the humor literature with the goal to identify the antecedent conditions that explain when comedy successfully elicits humor appreciation. Our review suggests that surprise and superiority, two antecedent conditions that humor theories leverage, do not explain humor appreciation. People laugh even when they feel neither surprised nor superior, and they can feel both surprised and superior without laughing or feeling amused.

Importantly, our review also revealed broad support for three antecedents for humor appreciation: simultaneity, violation appraisal, and benign appraisal (Figure 1). Studies show that people are more likely to laugh, feel amused, and think something is funny when they hold simultaneity, violation, and benign appraisals than when any of these conditions is absent. In addition to being consistent with the existing data, these three antecedent conditions are included in a range of theories. All but two of the general humor theories listed in Table 1 include one or more of these antecedents. Three theories identify all three, albeit using different terminology: reversal theory (Apter, 1982; Wyer & Collins, 1992), detection of mistaken reasoning theory[6] (Hurley et al., 2011), and the benign violation theory (McGraw & Warren, 2010; Veatch, 1998; Warren & McGraw, 2015). The conditions described by these three theories (e.g., diminishment vs. mistake vs. violation appraisal) are not exactly the same, but they are similar enough that we were unable to find studies that test the subtle differences between them. Developing more precise definitions and ways to operationalize these constructs will be a useful direction for future research. To make the terminology in the rest of our discussion manageable, we borrow language from the benign violation theory because we believe that the terms "violation" and "benign" are more general than those used in reversal and mistaken reasoning theories (i.e., diminishment, mistake, paratelic state, protective frame, harmless, and trivial).

Three Antecedents to Humor Appreciation

Our review suggests that three antecedent conditions—a benign appraisal, a violation appraisal, and simultaneity—collectively help predict and explain humor appreciation. Removing any of these ingredients tends to reduce humor

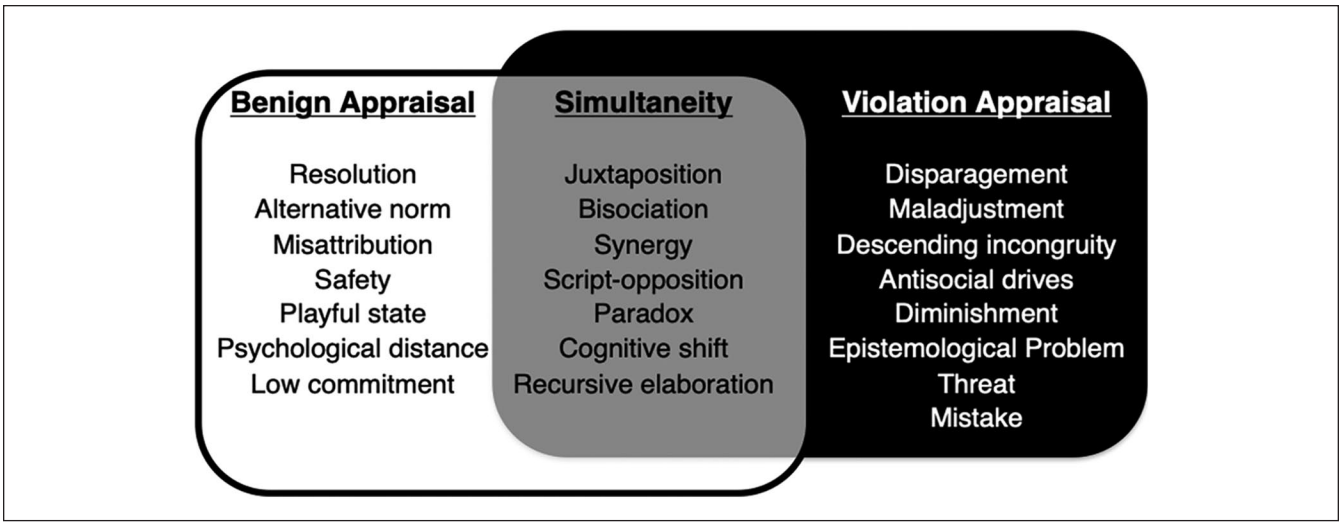

Figure 1. The benign violation theory identifies three antecedent conditions of humor appreciation: a benign appraisal, a violation appraisal, and simultaneity.
Note. This figure illustrates these three appraisals along with the names of synonymous or component constructs discussed in the literature.

appreciation. A person neither laughs nor feels amused if she fails to appraise a violation, appraise the violation as benign, or hold both appraisals at the same time (McGraw & Warren, 2010; Veatch, 1998). We illustrate this with examples below and in Table 3.

Consider an example of a little girl laughing while being tickled by her father. Although tickling involves an attack, the attack is harmless (Veatch, 1998); the little girl is not hurt, and the aggressor is a trusted parent. Tickling would fail to trigger laughter if the parent hugged the child instead (no violation appraisal). If the father were to get too rough during the tickle attack and start to hurt his daughter (no benign appraisal), her laughter would cease (and likely turn to tears). Finally (and sadly), if the parent hit and then hugged her, she would not laugh, because she would not process both the benign (i.e., hug) and violating (i.e., hit) acts at the same time.

Another example involving wordplay illustrates how removing one of these antecedents reduces humor appreciation. Consider a customer who compliments a baker for having "nice buns" (Warren & McGraw, 2015). Although it is generally considered inappropriate to publicly comment on someone's buttocks, this norm violation might seem acceptable because "buns" can refer to the baker's bread rather than his backside. If the customer told the baker "nice bread" instead of "nice buns," the statement would be missing a violation. Similarly, the baker may not find the "nice buns" compliment funny because he only interprets "buns" to mean bread and thus misses the sexual connotation. Conversely, if the customer told the baker, "nice butt," there is not an alternative nonsexual interpretation of the comment, and thus it is less likely to seem funny. Finally, the baker may not interpret both meanings of "buns" until the wordplay is later explained. At this point, even though he would recognize that "buns" could mean both his bread and his backside, the baker would not be amused because of a lack of simultaneity. The simultaneity condition helps explain why people are not as amused by a joke if it needs to be explained to them. The condition also suggests why timing and brevity are important to successful comedy (Veatch, 1998). The faster a comedian can switch an audience's perspective, the more likely the audience will hold multiple interpretations.

In addition to explaining when comedy successfully yields humor appreciation, the antecedent conditions revealed in our review—a violation appraisal, a benign appraisal, and simultaneity—offer new insight into two questions that have intrigued humor researchers and professionals alike: (a) what are the functional and adaptive benefits of humor, and (b) what accounts for the substantial variability in humor appreciation across people and situations?

What Are the Adaptive Benefits of Humor?

Identifying a violation appraisal, benign appraisal, and simultaneity as the essential ingredients in successful comedy helps answer this question. Combining these three antecedent conditions with what we have learned from studies investigating laughter in nonhuman animals and children points to several clues about the functions and adaptive benefits of humor.

The first clue comes from the fact that humor appreciation, unlike many other emotional experiences, is associated with a specific vocal behavior: laughter (Koestler, 1964; Veatch, 1998). Three pieces of evidence suggest that laughter is a primitive form of communication (Hayworth, 1928). One, laughter develops before speech. Babies laugh before they talk, and apes, dogs, and arguably even rats can laugh (Gervais & Wilson, 2005; Panksepp, 2005; Simonet, 2004).

Table 3. Examples of Comedic Stimuli, Antecedent Appraisal Conditions, and Contextual Changes That Influence Humor Appreciation According to the Benign Violation Theory.

Stimulus	Violation appraisal	Benign appraisal	Simultaneity appraisal
Television viewers see a cartoon villain fall into an open sewer after tripping on an ant.	The villain is hurt. Ants are too small to trip a person.	*Psychological distance*: Man is fictional and is neither symbolically nor literally close to viewers. *Low commitment:* Viewers do not care about the well-being of the villain. *Misattribution*: Viewers can attribute their amusement to tripping over an ant rather than the harm.	The viewer recognizes pain and injury are bad but that this character deserves it.
Less funny/appraisal absent if:	The villain walks safely around the open sewer.	The viewer (a) thinks that a real person was hurt by the fall; (b) they care about this person; and (c) the person fell directly into the open sewer without tripping on an ant.	The viewer does not notice the character slip and fall until he is shown climbing out of the sewer.
You hit your friend in the face with a banana cream pie.	You assaulted your friend.	*Safety*: the banana cream pie won't hurt. *Distance*: you are not messy with pie.	You see the banana cream pie as being both a weapon and a dessert. It was both an act of malice and love.
Less funny/appraisal absent if:	You give your friend a banana cream pie.	You hit your friend in the face with a sledgehammer.	You give your friend a pie, and later punch him in the face.
Comedian Mitch Hedberg says, "I like an escalator because an escalator can never break. It can only become stairs."	Escalators do break.	*Alternative norm*: When an escalator breaks, people can still use it as stairs.	The audience recognizes that a broken escalator is the same thing as stairs.
Less funny/appraisal absent if:	Someone says, "When escalators break, they look like stairs."	Someone says, "I like an elevator because an elevator can never break. It can only become stairs."	The audience doesn't realize that a broken escalator can be used as stairs.
A mother covers her face and says, "Peek-a-boo" to her baby.	The baby, who has yet to completely develop object permanence, thinks the mother is gone.	*Alternative norm*: The baby realizes the mother is still right in front of him.	The baby thinks the mother is gone yet sees and hears her at the same time.
Less funny/appraisal absent if:	The baby develops object permanence and knows that the mother never left.	The baby thinks that his mother has actually disappeared and is not returning.	The baby initially cannot find his mother but later sees her.
You read a joke: "when a clock is hungry, it goes back four seconds."	The phrase "for seconds" is misspelled.	*Alternative norm*: "Four seconds" is the correct way to spell a unit of time.	You understand the phrase "going back four seconds" can refer both to eating more and resetting the time.
Less funny/appraisal absent if:	You read: "when a man is hungry, he goes back for seconds."	You read: "when a clock is hungry, it goes back four minutes."	Someone needs to explain the double meaning of "going back four seconds" to you.
A shopper walks by a little girl waiting in line to see Santa Claus holding a handwritten sign that says, "I love Satan."	Most shoppers believe that little girls shouldn't worship Satan. The girl misspelled "Santa."	*Resolution*: The shopper realizes that the girl was trying to spell "Santa."	The shopper understands both the literal (the girl loves Satan) and the intended (the girl loves Santa) meaning of the sign.
Less funny/appraisal absent if:	The sign says, "I love Santa."	The sign says, "Heil Hitler."	The shopper only realizes the sign says "I love Satan" when a friend later recounts the incident.
You respond to a friend by typing, "just finished meditating" into your phone, but the autocorrect program changes your response: 	It is not appropriate to tell a friend you were masturbating. You did not intend to tell your friend you were masturbating.	*Alternative norm*: You were not actually masturbating; you typed that you were meditating. Misattribution: The autocorrect program, not you, made the inappropriate comment.	You know that you typed "meditating" but the text actually said "masturbating."
Less funny/appraisal absent if:	(a) The autocorrect did not change your message. (b) Autocorrect changed your message to "just finished mediating."	You intentionally typed "just finished masturbating." And included a photo.	You don't learn what "masturbating" means until years after sending the text.

Two, laughter occurs primarily in social settings. Apes, children, and grownups are all more likely to laugh when near others than when alone (Addyman et al., 2018; Provine, 2001; Scott et al., 2014). Three, laughter is universally recognizable (G. A. Bryant et al., 2018; Provine, 2001). Even if people do not speak the same language, they can recognize when another person is laughing (G. A. Bryant et al., 2018).

As a primitive form of communication, what does laughter say? One answer, which is consistent with humor appreciation requiring a benign appraisal, is that laughter signals that something is nonthreatening or harmless (Gervais & Wilson, 2005; Wood & Niedenthal, 2018). Our review suggests that this answer is correct but incomplete. As prelanguage communication was severely limited, each vocalization would need to have been as informative as possible (Corballis, 2009). Most of the time, there is no value in telling others that there is nothing to worry about. Signaling that something is benign is useful only when there is a potential threat; someone is chasing you, a caregiver disappears ("peek-a-boo!"), or no one knows what to say after an awkward silence. In other words: when people might detect a violation. Our review thus supports a more specific answer, initially suggested by Ramachandran (1998): laughter communicates that a potential threat is not a concern.

Many evolutionary adaptations serve multiple purposes (Buss et al., 1998), and humor appears to be no exception. As humans developed complex social networks, producing comedy and readily appreciating humor became a useful tool for building relationships (Kurtz & Algoe, 2015; Martin & Ford, 2018). Humor appreciation facilitates rough-and-tumble play, the most common source of laughter in nonhuman primates, which promotes social development later in life (Pellis & Pellis, 2007). In nonhuman primates, for which social interactions are largely physical rather than cultural or linguistic, laughter occurs primarily in response to mock physical aggression (Gervais & Wilson, 2005; Panksepp, 2005; Provine, 2001). Contemporary human cultures, however, are characterized by a complex array of social norms, identity roles, language, and logic systems, all of which can be threatened. Thus, just as disgust evolved from an aversion to oral contaminants to an aversion to a wide range of physical and social behaviors (Rozin et al., 2008; Tybur et al., 2013), humor appreciation may have similarly expanded from a positive response to a baseless physical threat to a positive response to the wide range of minor setbacks, hypothetical perils, friendly insults, social missteps, cultural misunderstandings, absurdities, and other benign violations that amuse and make people laugh (McGraw & Warren, 2010). Comedy may thus help people build and maintain complex relationships. For example, being able to joke about something that was the source of a fight with your romantic partner indicates that you have resolved the conflict (Keltner & Monarch, 1996). Consistently, couples that laugh together tend to have stronger and more supportive relationships (Kurtz & Algoe, 2015). Joking and laughter provide a foundation for nonthreatening communication not only among friends and romantic partners, but also between strangers and even rivals (O'Quin & Aronoff, 1981).

Encryption theory (Flamson & Barrett, 2008) highlights a related adaptive benefit of humor. To survive, people need to find partners for both mating and strategic alliances. Flamson and Barrett (2008) contend that humor evolved to help people identify partners who share their knowledge, values, and worldview. If people laugh when they simultaneously appraise something to be benign and a violation, then laughter signals that the laugher thinks something is wrong but does not believe it is a problem. Laughter, and humor appreciation more generally, thereby creates an honest signal of a person's understanding and commitment to a variety of social, cultural, and linguistic norms. Learning that someone shares your sense of humor reveals that they also share your values and beliefs (McGraw & Warner, 2014), and observing someone laugh with you makes you feel more similar to them (Kurtz & Algoe, 2017). In addition, to effectively produce comedy, it helps to have a strong understanding of cultural, social, and linguistic norms, as well as which of these norms can be broken. The ability to make people laugh, thus, may also offer a credible signal of intelligence and even gene quality (Greengross & Miller, 2011; Miller, 2000).

Finally, humor appreciation appears to help people cope with loss, difficulties, and other challenges in life. Frankl (1985) famously discussed the importance of humor in surviving the concentration camps of Nazi Germany: "I would never have made it if I could not have laughed. Laughing lifted me momentarily . . . out of this horrible situation, just enough to make it livable . . . survivable." As humor appreciation requires an appraisal that an apparent threat is actually benign, laughter and amusement help people dissociate from distress. For instance, people who are prone to experience humor, such as comedians, are more likely to joke in response to seeing tragic pictures, thereby alleviating and transforming the experience of the event (Salameh, 1983). Similarly, people who report being prone to appreciating humor have more positive emotional reactions to negative life events compared to those who report low proneness to humor (Kuiper et al., 1992). In their seminal study on laughter and bereavement, Keltner and Bonanno (1997) found that Duchenne laughter observed during a stressful interview about the death of a spouse was related to (a) less negative emotion, (b) more positive emotion, and (c) and less distress. These findings suggest that people's ability to appraise a potentially threatening situation as simultaneously being benign can help them cope with a variety of problems.

How Do Contextual, Cultural, and Individual Differences Influence Humor Appreciation?

Finally, our review suggests new insight as to why people have vastly different opinions about what is humorous. A violation appraisal, benign appraisal, and simultaneity are all

highly subjective. A person's interpretation of an event depends on their context, culture, and subjective position within their culture. A humor theory that requires these three ingredients therefore predicts high intraindividual, interindividual, and intercultural variability in humor responses to the same stimulus, which is exactly what is observed in the world (see Table 3).

One of the challenges of creating comedy (and studying it) is that the same stimulus is funny in some situations, but not in others (Gray & Ford, 2013; Mitchell et al., 2010). A person's social context influences how she interprets a stimulus and, consequently, what she considers benign and a violation. A story about "Thomas the vomit comet," might make people laugh at a cocktail party, where the nickname seems mischievous (i.e., a benign violation). However, the story would seem wholly inappropriate (i.e., not benign) if told to a classroom of first-graders. Conversely, the same nickname might seem too tame (i.e., no violation) to amuse the audience at a comedy club where comedians joke about late-term abortions and smoking crack (McGraw & Warner, 2014).

Consistent with the saying, "Comedy doesn't travel," a second challenge is that the same stimulus can seem funny to some people but not others. A humor theory thus should also explain intercultural variability in humor responses to the same stimulus (Bremmer, 1997). The same attempt to produce comedy can be funny in one culture, where it seems like a benign violation, offensive in a second culture, where it does not seem benign, and unexceptional in a third culture, where it does not seem like a violation. For example, the movie *Borat* amused Americans, who felt distant enough to view the protagonist's social gaffs (e.g., bringing a live chicken on a New York City subway) as benign, offended the government of Kazakhstan, who found *Borat*'s insulting portrayal of their culture neither accurate nor acceptable (i.e., not benign), and triggered little direct emotional response from Borat himself because the character ostensibly believed that behaviors like carrying a chicken on a subway are perfectly normal (i.e., no violation). The different cultural thresholds for the strength of a violation and the extent to which it seems benign thereby explain why the content of comedy varies so dramatically, while the experience of humor appreciation remains remarkably similar, across cultures (Apte, 1985; Martin & Ford, 2018).

Even within a culture, the same stimulus (e.g., wordplay, flatulence) can be funny to one person (benign violation), offensive to another (violation), and boring to a third (benign). Thus, a humor theory should be able to account for the interindividual variability in humor appreciation. People's values, experiences, and personalities influence the way that they interpret a stimulus, and the degree to which a person finds a norm violation acceptable explains why sexist people are more amused than their nonsexist counterparts by sexist jokes (Greenwood & Isbell, 2002; Moore et al., 1987). Men's rights activists, for example, are more likely to laugh at a misogynistic joke than feminists.

Questions for Future Research

Our review provides a theoretical roadmap to help identify questions for future research. *Question one*: what are the properties of a situation or stimulus that cause people to appraise it as being both a violation and benign? Knowing that comedy succeeds not when the audience is surprised but when they perceive a benign violation is helpful, but this knowledge is too abstract to provide an instruction manual for comedians. Pranksters need to know how to craft their tricks, comedians need to know how to structure and time their jokes, and ticklers need to know how, where, and when to touch their victims so that people who see the prank, hear the joke, and feel the tickle appraise these stimuli as benign violations. Subtle changes—a pause, a facial expression, adding or subtracting a single word—can turn yawns into laughs or amusement into disgust. Uncovering the properties of the stimuli that evoke benign and violation appraisals requires domain-specific, rather than general, humor theories. Researchers are already doing excellent work in some domains, including verbal humor (Attardo & Raskin, 1991), puns (Kao et al., 2016), and irony (Giora & Attardo, 1998), but there is less work that attempts to specify what makes practical jokes, slapstick, tickling, physical gestures, or other types of comedy be appraised as benign violations. Researchers need to continue to develop theories that span the ladder of abstraction by identifying both general psychological antecedents (e.g., violation appraisal, benign appraisal, and simultaneity) of humor appreciation and concrete properties of the situations or stimuli that evoke these psychological reactions.

Question two: are there additional antecedents for humor appreciation that the literature has not yet identified? Many examples of what Rozin and colleagues (2013) call benign masochism, such as eating extremely spicy food, getting a painful massage, or receiving an amorous spanking seem likely to be appraised as benign violations but unlikely to evoke laughter or amusement. Likewise, even when audiences view magic tricks as benign logic violations, they might be more prone to experience wonder and awe than laughter and amusement. Thus, research should look for additional conditions that distinguish what is funny from what is not.

Question three: how might the psychological antecedents of humor appreciation vary across cultures? An overwhelming majority of humor research has recruited participants from only wealthy Western cultures. As we discussed in the previous section, the stimuli that people think are funny vary dramatically across cultures. Although we believe that the benign violation theory can help explain this cultural variation, few studies have explicitly examined which appraisals best explain humor appreciation in non-WEIRD (Western, Educated, Industrialized, Rich, Democratic) cultures (Henrich et al., 2010).

Recommendations for Future Research

To answer these questions, researchers will need to overcome the theoretical and methodological habits that have

limited prior work. Thus, our article also outlines a methodological roadmap which can help guide future research. First, humor researchers need to un-jingle and un-jangle their jargon. Disambiguating terminology, as we have attempted to do in this review, can help researchers see connections between studies and build on existing work, rather than rediscover the same antecedent conditions using different terms. To do this, researchers need to develop more precise definitions, taxonomies, and operationalizations of their constructs. Warren and McGraw (2016a) offer an example of how to un-jangle incongruity. They distinguish between and measure four different versions of incongruity—surprise, atypicality, simultaneity, and a violation appraisal—and examine which version best differentiates humorous from nonhumorous stimuli (events, products, social interactions, videos, etc.). Identifying precise conceptual and operational definitions will be necessary to (a) refine the benign violation theory; (b) distinguish the theory from other general humor theories (e.g., reversal theory and detection of mistaken reasoning theory); and (c) integrate the benign violation theory with more concrete, domain-specific humor theories.

Second, instead of seeking evidence that confirms a humor theory, researchers need to also look for disconfirming evidence. The tendency to search for confirming evidence, of course, is not limited to humor research. It pervades science and human cognition more generally (Klayman & Ha, 1987; Nickerson, 1998). One instance of this confirmation bias is that humor researchers often test hypotheses using only stimuli that are relatively humorous (e.g., jokes or cartoons) without also considering whether their hypotheses inaccurately predict that nonhumorous stimuli (e.g., profound poems, disgusting photographs, and scary movies) evoke humor appreciation (Warren & McGraw, 2016a). Just because funny jokes are surprising does not imply that surprise helps explain humor appreciation if unfunny poems, photographs, and movies are also surprising.

Another instance of the confirmation bias in humor research is the tendency for researchers to claim that evidence supports one theory when it is consistent with multiple theories. We thus encourage researchers to identify situations in which humor theories—or at least the component antecedent conditions they propose—make different predictions. We have attempted to do this throughout the review. For example, theories that leverage superiority and theories that leverage a violation appraisal make competing predictions about whether the aggressor or the victim is more likely to laugh during chasing games, rough-and-tumble play, and tickle attacks. Another promising avenue is to identify predictions that are consistent with some humor theories but not with others. For example, the benign violation theory predicts that psychological distance, which reduces perceived threat, should increase the extent to which highly threatening stimuli (e.g., a brutal insult) seem funny by making it easier to appraise these violations as benign, but decrease the extent to which mildly threatening stimuli (e.g., an awkward silence) seem funny by eliminating the violation appraisal. Indeed, people are more amused by tragedies, like a woman who foolishly squanders thousands of dollars or an image of a man with a finger through his eye socket, when they are hypothetical, afflict strangers, happened a long time ago, or appear to be far away; conversely, people are more amused by minor mishaps, like a woman who foolishly squanders a couple of dollars or an image of a man with ice on his beard, when they are real, afflict close friends, happened recently, or appear to be nearby (McGraw et al., 2012). It is unclear how other humor theories, including reversal theory and detection of mistaken reasoning, can account for this pattern of results.

Third, after developing predictions that could refute a theory or test between theories, humor researchers need to test these predictions across a wider range of stimuli and people. General humor theories attempt to explain the conditions that produce laughter and amusement (a) across different types of comedy and (b) across different types of people. Yet, most studies have only tested what makes jokes or cartoons humorous to college students or online panelists in WEIRD cultures. An even more limiting habit that future research needs to break is comparing a single humorous stimulus with a single nonhumorous stimulus. Discovering that a funny picture of Porky Pig lights up a different part of the brain than a somber Porky pic provides approximately the same amount of evidence as an experiment that has one participant in each condition (see Wells & Windschitl, 1999). Alden et al. (1993) offer an example of a study that transcended both of these limitations; they collected and analyzed 202 television advertisements from the United States, Germany, South Korea, and Thailand.[7] Moving forward, we encourage researchers to seek evidence that refutes or arbitrates between existing theories using a broader set of stimuli (not just jokes, and definitely not just two jokes) and people (not just WEIRD college students).

Conclusion

People laugh almost every day in almost any type of social setting. Scholars have agreed that understanding humor is important, but they have not agreed about what conditions catalyze laughter, amusement, and the perception that something is funny. Our review of the literature identified five conditions shared across general humor theories; however, our review of the empirical evidence found that only three of these conditions—a violation appraisal, a benign appraisal, and simultaneity—reliably trigger laughter and amusement. We hope that our article inspires humor researchers to continue to develop better ways to measure and manipulate these conditions to build more precise, accurate, and useful tools to help people produce comedy and appreciate humor. Better understanding what makes things funny can help people make friends and manage adversaries, ignite romance and

cope with heartbreak, elevate life-altering milestones and enjoy the many mundane moments in between.

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Notes

1. Some scholars use the label "mirth" rather than "amusement" (Martin & Ford, 2018; Ruch, 1993). We use "amusement" because we believe more readers will understand it.
2. This number does not include domain-specific humor theories, which attempt to explain only certain types of humor, such as irony (Giora, 1995), puns (Binsted & Ritchie, 1997, 2001), set-up and punchline jokes (Attardo & Raskin, 1991; Raskin, 1985), or insults (Zillmann, 1983), rather than all instances in which people find something funny, laugh, or are amused.
3. Some scholars use the label "incongruity" rather than "violation" (Morreall, 1983, 1999; Spencer, 1860). We use "violation" to distinguish this condition from surprise and simultaneity, which the literature also refers to as "incongruity."
4. Westbury and Hollis identified two other funny word categories, fun-party words and animals that at first glance appear less likely to be appraised as violations. However, many of the examples from these categories were either directly related to humor (e.g., "chuckle" and "giggle") or also evoke a dirtier alternative meaning (e.g., "boogie," can mean dance or snot; "sausage" can be a food or a sexual innuendo).
5. It is also a communication violation because the doctor was clearly asking, "what are you doing about the baby"; not "what are you doing about the pen."
6. Hurley et al. did not explicitly name their theory; this is our name for it.
7. Although this study offers one of the few examples of humor research that has sampled both stimuli and respondents from different cultural backgrounds, it is limited in another way. It includes only humorous advertisements; thus, there is no way to know whether the findings might also describe nonhumorous ads.

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