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The Impact of Humor on Energy, Tension, Task Choices, and Attributions: Exploring Hypotheses from Toughness Theory

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The Impact of Humor on Energy, Tension, Task Choices, and Attributions: Exploring Hypotheses from Toughness Theory [1]

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Hypotheses derived from toughness theory suggest that nonaggressive humor should lead to increased feelings of energy without influencing tension, to preferences for studying materials that require more effort and energy, and to ratings of mundane laboratory activities as more challenging but not more threatening. Eighty-one college-age men and women were randomly assigned to watch a 12-minute video of Bill Cosby's humor or to watch a nonhumorous control video that analyzed the Cosby comedy routine. The humor condition resulted in significant increases in feelings of energy but not in feelings of tension. The other hypotheses were also confirmed except that performance on the mundane tasks was not significantly enhanced by exposure to humor. The usefulness of considering arousal quality rather than only quantity is discussed, as is the question of whether these results could be mediated by increased positive affect rather than increased energy. Implications of these results for toughness theory and for theories of humor are considered.

What is the relationship of humor to arousal? Does humor increase arousal and/or tension, or relieve it? Both answers have been endorsed by different theorists, and both receive support from different research traditions. Researchers who have found that humor reduces subsequent aggression (e.g., R. A. Baron, 1978; R. A. Baron & Ball, 1974; Prerost & Brewer, 1977) have emphasized

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the arousal reduction function of humor (in addition to or alternatively with an incompatible response explanation). When humor is found to enhance aggression (Mueller & Donnerstein, 1983) its arousal-generating character is emphasized. Findings that prior stimulation of arousal leads people to laugh more at subsequent humor (Schachter & Wheeler, 1962) or to rate humor as more funny (Cantor, Bryant, & Zillmann, 1974; Prerost, 1975) can support either interpretation. Some theorists (e.g., Berlyne, 1967) have employed both concepts by suggesting that the experience of humor is associated with arousal increases to moderate levels, but with the release of high levels of arousal.

However, more direct physiological tests of the association of humor with arousal have consistently found that humor stimulates sympathetic nervous system (SNS) arousal (Godkewitsch, 1976) and associated peripheral catecholamine increases (especially adrenaline; Fry, 1986). Following his review of those studies, McGhee (1983) concluded that there is a linear relationship between humor appreciation and arousal.

But to understand the implications of a linear relationship between humor and arousal, we must be as concerned with arousal quality as with quantity. A primary distinction in arousal quality is that SNS-adrenal-medullary arousal (as indicated by increased adrenaline and noradrenaline) corresponds with physical and mental task demands; in the absence of pituitary-adrenal-cortical arousal, spikes of SNS-adrenal-medullary arousal (but not high base rates) are energizing (Frankenhaeuser, 1979). On the other hand, pituitary-adrenal-cortical arousal (indicated in humans by increased cortisol) is associated with feelings of tension.

Since humor is associated with only increases in SNS-adrenal-medullary arousal, predictions of humor's impacts on mood, attributions, and performance should correspond with how SNS-adrenal-medullary arousal impacts those variables. In turn, predictions concerning the impacts of SNS-adrenal-medullary arousal are derived from toughness theory. Toughness theory (Dienstbier, 1989) suggests that periodic exposure to cycles of challenge (physical or psychological) and rest leads to increased neuroendocrine capacities in the central nervous system and in the body generally. Among other changes, toughened individuals experience an increased SNS-adrenal-medullary capacity, and in the presence of familiar challenges and stressors, or in anticipation of challenges, they experience increased arousal of that system with suppression of pituitary-adrenal-cortical responding. That arousal pattern leads to increased blood sugar, and thus to feelings of energy without increased tension, and to superior task performance. Thus it is hypothesized that humor that is presented before taxing tasks will lead to SNS-adrenal-medullary arousal and subsequently to positive predictions that the tasks will be challenging, with successful outcomes, rather than threatening.

Although these hypotheses were derived from considerations that include mediating physiological systems, no physiological measurements were made nor were physiological hypotheses tested. Specifically, the hypotheses were that:

1.Prior humor should increase feelings of energy but not of tension, as measured by Thayer's (1989) well-established and factorially independent measures of those dimensions.

2. Prior humor should increase one's willingness to choose potentially effortful tasks, operationalized here as choosing to study material that requires more energy and is more taxing.

3. Prior humor should stimulate more positive appraisals of potentially boring mental tasks. Both before and after those tasks are undertaken, they should be rated as more challenging and energizing (but not more threatening) as those terms are used by Lazarus and colleagues (Folkman & Lazarus, 1985).

4. Prior humor should enhance performance in subsequent tasks.

Although these hypotheses were derived from toughness theory, the literature on the impact of positive affect on decision making suggests similar hypotheses. For example, it has been shown that positive, but not negative, affect induction leads to greater creativity, more elaboration of thought processes, and better performance on neutral and positively valenced tasks (see Isen, 1993, for a review). Two different mediators may be responsible for positive affect's impacts-the increased associative richness of positively valenced materials that Isen noted, and increased energy that leads to increased stimulation seeking, working for longer periods on interesting puzzles, and more time spent elaborating interesting decisions. These are, obviously complex issues. Although this research is not designed to be a critical experiment, these procedures allow some differentiation of the relative contributions of positive mood versus energization as mediators of the impact of humor on the dependent measures used here. These issues are considered again in the Discussion section.

METHOD

Subjects

Students from the basic psychology course volunteered to fulfill their research participation requirement. Forty men and 41 women participated in same-gender groups of up to 12 subjects.

Procedures

The sign-up and consent forms indicated that this was a study of "humor appreciation and entertainment preferences." Immediately after consent form procedures, subjects were randomly assigned to either a humor or a control condition. Those two conditions were physically separated in different rooms with room assignments counterbalanced between conditions (within gender). In order to bring all subjects to a similar but low state of arousal, subjects were first involved in nonstimulating questionnaire activities for other research purposes for 35 minutes.

Before seeing their respective videos, both humor condition and control subjects were reminded that we wished to study their responses to humor-relevant materials. Humor condition subjects then watched a videotaped segment of approximately 12 minutes of excerpts from a made-for-TV Bill Cosby humor routine. The routine was specifically selected to be essentially free from aggressive content, dealing with such topics as Cosby's experiences as an expectant and new father, the birth of his child, the training of his son to be a successful athlete, and so forth. To approximate some balance of the cognitive content between conditions, control condition subjects listened to and watched a non-humorous videotaped lecture that described and analyzed all of the segments in the Cosby routine seen by the other subjects.

To support the rationale that the study concerned “humor appreciation and entertainment preferences,” subjects were asked about their usual entertainment preferences. Subsequent questions that were key dependent measures asked about their “preference for studying *right now”* study materials that differed on dimensions of “boring” versus "challenging" and “relaxing” versus “challenging.” Relaxing studying was defined as doing something easy “like reading for a course in the novel,” whereas challenging would “include more difficult material, such as in a sociology course, where you would learn more but work harder.” It was assumed that “boring” needed no definition. To indicate preferences, subjects placed a mark on the 85-millimeter lines separating relaxing versus challenging, and separating boring versus challenging.

Subsequently, subjects responded to a mood checklist. The mood factor of Elation, as defined by the three mood items of “pleased,” “elated,” and “overjoyed” (Nowlis & Green, 1965), was of especial interest (Cronbach's a. = .71). Thayer's (1989) 10-item dimensions of Tension and Energy were also assessed.

The next task of proofreading was designed to be boring, and was introduced to subjects as a test of “verbal skill.” After that task was accurately described and shown to them, subjects rated (on scales described below) how

challenging and energizing they expected the task to be. They then undertook the timed proofreading for 3 minutes, with instructions to find as many errors as possible. The text had approximately 1.5 errors per printed line, and was about the problems created for the Psychology Department by having a dramatic increase in psychology majors. After task completion, subjects rated how challenging and energizing they found it to be.

Similarly, before and after working on another boring 3-minute timed task of finding words in which the letter "a" appeared (finding As), ratings of challenge, energy, and stressfulness were made. As with proofreading, these task activities began on the instruction page so that subjects were fully aware of the nature of the task before their preliminary ratings. The task consisted of several pages of words, with five words on each line; subjects underlined the one word per line that contained an "a."

Pre- and posttask ratings of the actual activities of proofreading and finding As were made on 7-point Likert scales using endpoints of *challenge* (vs. the negative options of *stressful* or *boring)* and *invigorating* (vs. the negative options of *draining* or *tiring).*

Before being debriefed, subjects completed a detailed and specific postexperimental questionnaire. Specifically, they indicated any suspicions that the humor segment was presented for purposes "other than the purpose explained to you." Follow-up questions asked the nature of and the timing of those suspicions.

RESULTS

Suspicion

No subjects indicated moderate or higher levels of hypothesis-relevant suspicions, so no subjects were lost.

Impacts on Mood

As indicated in Table I**,** on Thayer's (1989) dimensions of Energy and of Tension, humor condition subjects reported significantly more Energy but they did not experience more Tension. To test whether humor's impact was significantly greater on Energy than on Tension, those data were analyzed in a 2 (Gender) x 2 (Humor Condition) x 2 (Mood: Energy vs. Tension) repeated measures ANOVA; the significant condition by mood interaction confirmed the greater impact of the humor condition on Energy than on Tension, interaction $F(1, 75) = 7.02$, $p < .01$.

Table I. Means and Significance Levels of Rated Impacts of Humor Condition on Mood, Task Choices, and Task Attributions

	Experimental condition				
	Humor		Control		
Dependent measure	*M*	*SD*	*M*	*SD*	Significance Tests
Moods (Energy and Tension: range 0–30; Elation range: 0–9)					
Energy	13.9[a]	9.1	7.8[b]	7.0	$F(1,76) = 10.7, p < .01$
Tension	9.5[a]	4.6	8.5[c]	5.4	$F(1,75) < 1$, ns
Elation	3.6[a]	1.8	2.6[b]	2.3	$F(1,76) = 3.69, p < .06$
Preferences for studying (range 0–85)					
Challenge vs. Relax	27.5[a]	21.6	22.1[d]	15.5	$F(1,77) = 1.62$, ns
Challenge vs. Bore	52.9[a]	19.7	41.2[d]	21.3	$F(1,77) = 6.47, p < .02$
Attributions of tasks (range 0–24)					
Challenging	16.3[a]	3.2	14.4[d]	4.1	$F(1,77) = 5.34, p < .03$
Invigorating	13.4[a]	4.2	11.2[d]	5.1	$F(1,77) = 4.48, p < .04$

[a] $n = 41$.
[b] $n = 39$.
[c] $n = 38$.
[d] $n = 40$.

Humor condition effects on Elation were analyzed in order to illuminate the issue of relative impacts from energization and positive mood. As seen in Table **I,** humor condition impacts on Elation were almost significant. To test the relative impact of the humor manipulation on Energy versus Elation, a similar 2 (Gender) x 2 (Humor Condition) x 2 (Mood: Energy vs. Elation) repeated measures ANOVA found humor condition to have a greater impact on Energy than on Elation, interaction $F(1, 76) = 9.85, p < .002$.

Activity Preferences

To assess humor's impact on choice of studying easy or challenging material, two items assessed preferences for studying that was challenging versus relaxing, and challenging versus boring. The 2 (Gender) x 2 (Humor Condition) MANOVA of both those measures indicated that humor condition subjects preferred more challenging studying activities than did control subjects, $F(2, 76) = 3.38$; $p < .04$. As shown in Table **I,** when those two measures were considered separately, that effect was due mainly to a stronger humor condition preference for challenging versus boring material.

To explore the hypothesis that humor's impact on preference for challenging studying is mediated by energy rather than either tension or positive mood (as indexed by Elation), two multiple regression analyses were undertaken. The first explored the relative contributions of Tension and Energy on "Preference for Challenge" (based on the two combined challenge scales). Tension made no significant independent contribution to Preference for Challenge (whether or not humor condition was included as a predictor). However, with Tension partialled out, Energy was a significant predictor of Preference for Challenge, $R = .39$, $\beta = .34$, $t(76) = 3.12$, $p < .005$. Even with both Tension and humor condition partialled out, Energy contributed substantially to Preference for Challenge, $R = .42$; $\beta = .29$, $t(75) = 2.50$, $p < .015$.

The second multiple regression equation predicted the relative contributions of Energy and Elation to Preference for Challenge. Again, Energy made a positive contribution, $R = .39$, $\beta = .28$, $t(77) = 2.26$, $p < .03$, Elation did not, $\beta = .15$, $t(77) = 1.23$, ns. However, Energy was not quite a significant predictor of Preference for Challenge with both Elation and humor condition partialled out, $R = .42$, $\beta = .23$, $t(76) = 1.77$, $p < .10$.

The second analysis to establish mediation by energy used the test for mediation proposed by R. M. Baron and Kenny (1986). To show mediation by Energy, humor condition must be shown to affect Energy, it does; $r = .35$, $t(78) = 3.30$, $p < .002$, and humor condition must affect Preference for Challenge, $r = .26$, $t(79) = 2.46$, $p < .02$. In addition, when Preference for Challenge is predicted from both humor condition and Energy, Energy must still affect Preference for Challenge, $\beta = .31$, $t(77) = 2.79$, $p < .01$, and the impact of humor condition must be less than its independent effect on Preference for Challenge (indeed, the correlation of humor condition with Preference for Challenge declines, from $r = .26$ to $r = .16$). With those conditions met, the indirect effect of humor condition through Energy was tested and found to be significant ($t = 2.05$, $p < .05$) by the exact formula provided by R. M. Baron and Kenny. Thus the impact of humor condition on preference for challenging studying is through the mediation of Energy.

Task Attributions

Ratings were made before and after both proofreading and before and after finding As on dimensions of both challenge and invigoration. The reliability was acceptable for a four-item Challenge scale (Cronbach's $\alpha = .67$) despite the individual items being placed before and after two different tasks. Reliability for the four-item Invigoration measure was similarly satisfactory ($\alpha = .78$).

Humor condition effects on the Challenge and the Invigoration measures (taken together) of the laboratory tasks were examined first by a 2 (Gender) x 2 (Humor Condition) MANOVA. Humor condition effects were substantial, $F(2, 76) = 3.09$; $p < .06$, suggesting separate ANOVAS for Challenge and Invigoration (no other effects approached significance). In those separate ANOVAS, there were neither gender nor interaction effects, but as indicated in Table I, humor condition subjects rated those laboratory tasks higher in Challenge and Invigoration.

Several analyses similar to those described above address the hypothesis that the more positive attributions of the laboratory tasks by the humor condition subjects were mediated by energy rather than by either tension or positive mood (as assessed by Elation). The task ratings of Challenge and of Invigoration were each predicted in separate multiple regression equations. When task Invigoration ratings were predicted by Energy and Tension, Energy made a substantial contribution, R = .27; with Tension partialled out, $\beta = .28$, $t(76) = 2.40$, $p < .02$; those results remained almost significant with both humor condition and Tension partialled out, $R = .30$, $\beta = .23$, $t(75) = 1.86$, $p < .07$.

A second multiple regression equation assessed the relative contributions of Energy and Elation on task ratings of Invigoraton. Again, Energy made a nearly significant positive contribution, $R = .27$, $\beta = .25$, $t(77) = 1.86$, $P < .07$, Elation made none ($\beta = .04$). With the effects of humor condition also partialled out, Energy made a nonsignificant ($\beta = .20$) contribution.

Analyses for task ratings of Challenge were all weaker than those for Invigoration. At a nonsignificant level, Energy was consistently a stronger predictor of Challenge ratings than either Tension or Elation.

The R. M. Baron and Kenny (1986) test for mediation was applied to further test whether the humor condition's impact on Invigoration was mediated by energy. While the basic conditions for mediation were met, the exact test was not significant ($t = 1.56$, ns).

Performance

The analyses of performance on the (combined) two laboratory tasks with a 2 (Gender) x 2 (Humor Condition) ANOVA as described above revealed no performance differences between humor conditions. Unexpectedly, performance did not correlate positively with Energy ($r = -.15$, ns).

DISCUSSION

Results of the Hypotheses Tests

All the hypotheses proposed above were confirmed except for not finding a positive impact of humor condition on performance.

In contrast to control subjects, those exposed to humor reported feeling more energy but not more tension. And although they reported feeling in a more positive mood, as assessed by Elation, our humor manipulation made more of an impact on Energy than on Elation. Consistent with feeling more energy (and consistent with being in a more positive mood), humor condition subjects felt ready to undertake more challenging studying activities rather than studying activities that were boring. The hypothesis that feelings of energy mediate the effect of humor on choices for challenging studying was supported by the positive correlations between the mood of Energy and choices for challenging studying, without comparable correlations between the mood of Tension and study choices; the contribution of Elation to choosing challenging material for study was also significantly less than the contribution of Energy. The analyses presented to test Energy as a mediator between humor condition and preferences for challenging studying affirms the mediation of energy. Finally, humor condition subjects both expected and found subsequent laboratory tasks to be more invigorating. However, the evidence was nonsignificant that those relationships were mediated primarily by feelings of energy.

Given the substantial humor condition impacts on the mood, study choice, and attribution measures, but not on performance, the longevity of those impacts becomes an issue: The mood and study-choice measures discussed above closely followed the humor manipulations in time; they consumed 7 to 8 minutes. The ratings of the proofreading and finding As tasks followed, with the four rating periods (before and after each task) being made between 8 and 15 minutes after the humor manipulations. Thus although the absolute magnitude of the effect of humor on those task ratings is modest, the average elapsed time of 11.5 minutes, filled with interposed activities, would naturally lead to a diminished effect. In retrospect, the absence of a humor condition impact on task performance may be due to this substantial delay between the manipulation and that measure.

Alternative Explanations for These Findings

An assumption underlying these hypotheses was that the mediator between the humor manipulation and changes on the various dependent measures would

be the feelings of energy that should follow from the physiological responses accompanying humor. However, an alternative hypothesis is plausible, that the positive mood stimulated by the humor manipulation may mediate these results.

To assess this issue with these results requires caution, for the three-item measure of Elation is probably not an ideal measure of positive mood. A more comprehensive measure, such as the positive affectivity measure of Watson and Clark (Watson, 1988) may show more substantial positive mood impacts.

The reasonableness of the positive mood hypothesis is based on several observations. First, the humor video used here was essentially nonoffensive, and did stimulate positive mood as well as energy. Second, a variety of stimulus conditions designed to elicit pleasant or positive moods but not designed to be energizing (e.g., good weather; Schwarz & Clore 1983) or the receipt of a small gift (Isen, Daubman, & Nowicki, 1987) have led to positive judgments that are comparable to the positive task attributions found in this research.

However, the analysis from toughness theory (Dienstbier, 1989) of how the experience of energy may influence attributions is different from the dominant theoretical explanations of how positive mood may influence attributions. The toughness approach is comparatively limited, suggesting that feelings of energy lead to heightened expectations that efforts to cope will be successful in situations of challenge and/or threat, and that effortful tasks will be less taxing. Thus it is expectations and attributions for activities that require substantial energy that should be influenced by feelings of energy. On the other hand, research on the influence of mood on judgment suggest a more pervasive influence from moods, that mood may cause us to perceive mood-congruent aspects of our environment, to cue mood-relevant thoughts and memories, to form richer associations, to influence our judgments, and to improve our performance on neutral or positive tasks (see Morris, 1989, and Isen, 1993, for relevant reviews).

Clearly this study was not designed to be a critical test between rival hypotheses of positive affect versus energy as the mediator for humor's positive effects. Even the criteria presented by R. M. Baron and Kenny (1986) and used above for establishing the mediation of energy are discussed by those authors with an emphasis on the likelihood of multiple causality and multiple mediation. Finding mediation by energy does not rule out the possibility of mediation by positive affect, especially given the limited positive affect measure used here.

Implications for Theories of Humor and the Uses of Humor

The finding of humor increasing mood ratings of energy but not affecting tension requires some caveats. This finding was obtained in a research setting that was not particularly tension-generating (Le., mean Tension scores of 9.0 on a scale with a range from 0 to 30). Thus the possibility remains that humor may reduce tensions when the humor focuses upon the source of tension (e.g., hostile humor reducing aggression; R. A. Baron, 1978), especially when tension levels are high. Even with these qualifications, however, theories that depend upon the reduction of tension as the basis of humor (Freud, 1905; Shurc1iff, 1968) are challenged by these data.

These findings of the energizing effects of humor have implications for the productive role that humor may play, especially in environments where it is difficult to maintain attentiveness, alertness, and energy. The afterdinner speaker who begins with a funny story and the professor who intersperses humor in the lecture are potentially energizing audiences, who, like our subjects, are usually seated, immobile, and not allowed those activities that result in SNS-adrenalmedullary arousal and associated feelings of energy. Second, positive impacts on memory consolidation result from increased peripheral SNS-adrenal-medullary arousal (e.g., with animal subjects, see McGaugh, 1990) and from associated blood sugar increases (e.g., with elderly adults, see Manning, Hall, & Gold, 1990). While the positive impacts of topic-relevant humor on memory have been noted by Zillmann and Bryant (1983), those researchers have assumed the mediator of their effects was vigilance, rather than increased energy. Research to differentiate those mediators has not been designed.

Humor and Arousal Concepts

When psychology was most preoccupied with the relationship of humor to arousal, our concepts of arousal tended to be relatively unarticulated. When tension and arousal were thought to be almost synonymous, then increases in energy would imply tension increases. More articulate modern approaches to mood and arousal are supported by findings that humor may increase energy without affecting tension, for example, Thayer's (1989) system, or the negative and positive affectivity dimensions of Watson and Clark (Watson, 1988), or the more physiological approaches of toughness theory (Dienstbier, 1989).

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