Effectiveness and Sex Differences in Humor Coping Techniques

by

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Abstract

This thesis explored the relationship between humor and stress by examining the effects of self-directed humor on cardiovascular reactivity (CVR) and mood levels during exposure to a stressor. After baseline levels of blood pressure, heart rate, and mood were measured, 59 undergraduate and graduate student participants were exposed to 4 different stress and humor treatment conditions: 1) stress plus humor, 2) stress without humor, 3) no stress with humor, and 4) no stress and no humor. Measures of CVR and mood levels were then taken on 2 more occasions during the study in order to evaluate the effects of the 4 conditions. The humor treatment was comprised of 2 phases. The first phase consisted of a 5-minute video of the Mr. Bean character as portrayed by Rowan Atkinson, and the second phase consisted of a 5-minute writing exercise in which participants imagined themselves in the same situation as the protagonist. The stressor was a 10-minute recording of a crying 2-year-old child played at 90 dbs. It was hypothesized that males and females would be equally successful in their use of humor coping (measured by change in CVR and mood) as all participants would be benefiting from the same style of humor (self-directed). Results showed a main effect for the stressor in which participants not exposed to the stressor, demonstrated a pattern of acclimatization as their CVR and mood scores dropped over the course of the experiment. Exposure to the stressor neutralized this tendency causing CVR and mood scores to remain static or rise through the procedure. The humor treatment had no significant effect on any of the stress response measures but did interact with sex as a significant predictor of change in blood pressure.

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Effectiveness and Sex Differences in Humor Coping Techniques

Our language contains numerous references to the healing powers of humor (e.g., "laughter is the best medicine", "comic relief"); thus, it might seem obvious to us that laughter, or the humor that causes it, would be a natural mood enhancer. At the same time though, it is difficult to take seriously research that has humor as its main focus, even when the beneficial applications of such research may seem apparent. Indeed it is this combination of seemingly obvious benefits and lack of respectability that had banished humor research to the realm of folk medicine until recently. Prior to 1980, the PsycINFO database shows only five studies examining the relationship between stress and humor, compared with 148 between 1980 and 1999.

One of the events that inspired a new interest in humor research was the publishing of Norman Cousins' " Anatomy of an Illness" (1976). In this article, Cousins recounts how, after being diagnosed with an incurable, collagen-depleting disease, he was able to use his own "laughter therapy" to bring himself back to health. After conventional treatment and medications failed to bring him out of the downward spiral and his doctors were offering only a one in 500 chance of recovery, Mr. Cousins opted to check himself out of the hospital and remove himself from the prescribed medication. His self-created treatment consisted of large doses of vitamin C and a regimen of laughter provided by a library of Marx Brothers movies and Candid Camera reruns. He soon made the discovery that 10 minutes of laughter both decreased blood sedimentation-rate readings (an indication of reduced inflammation) and also had an analgesic effect, allowing him 2-hour stretches of pain-free sleep, which had not been possible before the laughter therapy. His

condition steadily improved, the connective tissue began to regenerate in his spine and joints, and within a matter of months he was able to jog, play the organ and return to work. Although it is possible that Cousins would have recovered with or without his customized therapy (not the opinion of his specialists at the time), or that Cousins had been the fortunate beneficiary of a particularly efficacious placebo effect, his experience was thoroughly documented and included pre-treatment and post-treatment physiological measures.

The publication of Cousins' article and the subsequent increase in attention to the benefits of humor inspired a proliferation of applied humor therapy. Banmen (1982), for example, espoused the virtues of the use of humor in psychotherapy and encouraged the introduction of workshops and courses to ensure its appropriate usage in this and other fields.

In an article outlining the benefits of humor for the elderly, Richman (1995) described patients who had managed to improve their quality of life by therapeutic use of humor despite physical and psychological ailments. Richman attributed these improvements to five principles of therapeutic humor: 1) a positive doctor-patient relationship includes the freedom to be humorous, 2) humor is life affirming, 3) humor increases social cohesion, 4) humor is interactive, and 5) humor reduces stress.

Erdman (1993) described how, at the Cancer Center of the Presbyterian Hospital in North Carolina, the use of a hall-roving "laugh mobile" loaded with joke books, comic videos, and humorous novelties brought about remarkable improvements in patients and staff alike. Although she did not consider it to have any curative ability, the responses of patients demonstrated that it was able to relieve a considerable amount of their suffering.

In another article promoting the use of humor among the elderly, Prerost (1993) described the benefits of humor as allowing one to appreciate the serious qualities of a situation, but at the same time distancing oneself from the deleterious effects of the resulting anxiety. Prerost's methods for encouraging the use of humor involve group sessions in which the clients use guided imagery and the concepts of incongruity, absurdity, and exaggeration infused into images of their own specific stressful situations. Later, the group shares these images and their reactions to the humorous injections. Prerost identifies the mechanism involved in the observed improved well being of his clients as an increased sense of mastery and control over the situations in life that produce stress.

The positive effects of laughter have been explored both on the psychological level (White & Camarena, 1989), and also on the physiological level (Berk, 1989; Dillon & Baker, 1985). It is in the latter that some of laughter's most well defined and objectively measured effects have been demonstrated, in particular its effects on the immune system. Berk (1989) discovered that laughter has a boosting effect on many of the components of the immune system. Specifically, engaging in laughter lowers serum cortisol levels, increases the amount of activated T lymphocytes, increases the number and activity of natural killer cells, and increases the number of T cells that have helper / suppresser receptors. Together these effects give a boost to the immune system while limiting the immunosuppressing effects of the stress response. By measuring immunoglobulin A (S-IgA), one of the body's first lines of defense against infection, Dillon and Baker (1985) were able to show that these levels were higher in participants who had just watched a humorous video than in control participants.

Using this same measure of immune system functioning, Martin and Dobbin (1988) examined the stress-moderating effects of humor. These researchers used four humor scales which measured three dimensions of humor: 1) the degree to which participants respond to situations with mirth, 2) their ability to see humor in day-to-day situations, and 3) the degree to which they use humor to cope with their problems. By examining the S-IgA levels of 40 participants over a 6-week period, they were able to show that those participants who reported a high degree of mirth and humor in their lives showed lower immunosupression effects when faced with stressful events. This suggests that humor provides a moderating effect on the stress response.

Cousins' belief that laughter had served him as an analgesic was later supported by a study by Trice and Price (1986) at the Salem University dental clinic. Forty patients undergoing amalgam restoration procedures (fillings) were coded for the presence of joking or laughter while sitting in the waiting room for a 15-minute period prior to seeing their dentist. After the procedure, those who had been coded for more frequent use of laughter gave lower subjective ratings of stressfulness than those who had not exhibited as much laughter. Although the data suggest a stress moderating effect, like much of the research done on humor and laughter, conclusions that can be drawn are limited by the correlational design. Using a prospective design to try and support the same hypothesis, Weisenberg, Tepper, and Schwarzwald (1995) failed to show that a humorous video had any more effect on pain tolerance than a similarly distracting but non-humorous video.

Using psychological measures, White and Camarena (1989) were able to demonstrate that laughter had beneficial long-term effects on mood. In their study, 93 participants were randomly assigned to weekly laughter sessions, relaxation sessions, or a

control condition (neutral video). Participants in the laughter group showed lower post-treatment levels of psychological stress and anxiety over the six-week study as measured on the A-state scale of the State-Trait Anxiety Inventory (STAI; Speilberger, Gorsch, & Llushene, 1970) and a mood-adjective checklist selected from those previously used by Bushnell (1979). Paradoxically, the physiological measures of stress (HR and blood pressure) did not show a corresponding reduction. The authors thought that this may have been explained by the fact that laughter initially increases autonomic functioning before the delayed, relaxing effects begin. The time lag can be as much as 10 minutes after the laughter ends (Fry, 1988). Measures taken immediately after treatments could have, therefore, been affected by the initial arousing effect of the laughter.

Theories on humor

Laughter is observed in all cultures and has been documented as far back as recorded time. Despite the universal observation of this instinctive but enigmatic behavior, researchers are still without a comprehensive explanation of its place in people's lives.

Over the years, laughter has defied categorization by philosophers and scientists alike. Is it an emotion, a reflex, or a learned behavior? Laughter takes place in such diverse situations (e.g., feeling embarrassment, feeling elation, being tickled, watching someone else's misfortune) that it does not easily conform to a single function. It is, therefore, hard to generate a single theory that can encapsulate all cases. Plato (380 B.C./1974) offered one of the earliest attempts at an explanation that has been dubbed the Superiority theory. Plato contended that laughter allowed us to feel good about ourselves by looking down on others who were less fortunate. For this reason he thought of

laughter as a cruel behavior and even advised against the portrayal of laughter in literature. This theory describes common themes that are still seen today in slap stick comedy and humor based on ridicule, but it does not explain the variety of other sources of laughter (e.g., incongruity, stressful situations, etc.).

The Incongruity theory put forward by Aristotle (330 B.C./1941), proposed that what makes us laugh is seeing something that is not in its ordinarily assigned role or a mismatch between conceptual understanding and perception. This explains why we might laugh at children dressed and acting as adults or other images that involve the ludicrous, but the theory again fails to explain many other causes of unrelated humor. One particular genre of humor that does not fit into either of the first two categories is sexual humor. Freud (1928) attempted to explain our humorous responses to sex by what he labeled Relief-theory, suggesting that certain culturally repressed topics, including sex and other bodily functions, make us laugh when we talk about them as this represents a release of nervous energy. Thus people snicker at bathroom humor and stand up comedians who use taboo subjects as part of their routines in order to relieve anxiety. As with other theories, this idea of "relief" can be seen in many types of humor but can not stand on its own as a comprehensive theory.

Morreall (1983) attempted to overcome this shortcoming by blending the three traditional theories (Superiority theory, Incongruity theory and Relief theory) into one. Combining their key elements, his theory states that laughter results from a "pleasant psychological shift". He theorized that the three features necessary for laughter creation were summarized in these three words. Morreall went on to explain that the shift may be cognitive, as in the case of incongruity, in which the jump is from the sensible cognition to

the ridiculous perception, or the shift might be primarily emotional, as in the case of the superiority and relief theories. In the latter two cases the shift is to an improved, positive feeling or a state of relaxation, respectively. The other two essential ingredients discussed by Morreall are the requirements that the shift be unexpected and pleasant. If the change is in the unpleasant direction, the stimulus is more likely to elicit emotions such as sadness or anger and if the change is expected or gradual, the experience is also unlikely to be interpreted as humorous. A more complete summary of Morreall's theory would then be that laughter results from a *sudden*, pleasant, psychological shift.

Taking a functional approach to the explanation of laughter, McDougall(1903) described what he called the "Displeasure Theory", which is in stark contrast to the traditional belief that laughter is caused by joy and happiness. McDougall pointed out that the things that make people laugh are often things that have nothing to do with joy. The misfortunes of others, the misfortunes of ourselves, vulgar indecencies, the incongruous and absurd, unexpected occurrences, and lies are all used to provoke laughter. Yet on closer inspection, other than the resulting laughter itself, there is nothing inherently joyful or pleasing about any of these items. As McDougal points out, these and most of the other things that cause one to laugh, such as being tickled, being extremely nervous or anxious, embarrassment, and other uncomfortable situations are actually unpleasant experiences. He, therefore, concluded that laughter, along with its accompanying psychologically and physically refreshing effects, is nature's adaptive response to these "displeasing" events. More recently Woodhouse (1993) has described laughter similarly as "nature's biofeedback, stress-control system".

Humor as a moderator of stress

In Martin and Lefcourt's widely cited 1983 article, three studies examined the relationship between humor and mood levels. In each of the studies, the Life Events of College Students scale (Sandler & Lakey, 1982) was used to predict stress scores as measured by the Profile of Mood States (McNair, Lorr, & Droppleman, 1981). Participants were also assessed for use of humor, which was recorded on six scales examining different dimensions of humor use. The combined results showed that five of the six humor measures demonstrated moderating effects on the relationship between the negative life events and mood. In each of the studies, participants who scored highly on humor showed lower correlations between negative life events and mood disturbances than did those who scored lower on the humor measures. Although the implications were clear, again because of the correlational design, no causal relation could be inferred.

Nezu, Nezu, and Blissett (1988) further explored the humor stress relationship using a prospective design that controlled for previous levels of stress in an attempt to show a causal link between humor and reduction of stress response. Using 87 participants, Nezu et al. measured baseline levels of distress symptomatology using the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock & Erbaugh, 1961), the STAI (Spielberger et al., 1970), the Life Experiences Survey (LES; Sarason, Johnson, & Siegel, 1978), and a self-report questionnaire that recorded stressful events in the person's life during the past year. During a second session, the above three tests were readministered but this time the participants were asked to list only stressful events that had occurred in the two months since the baseline measure. Two humor scales, the Coping Humor Scale (CHS; Martin & Lefcourt, 1983) which measures the deliberate use of humor as a coping

strategy, and the Situational Humor Response Questionnaire (SHRQ; Martin & Lefcourt, 1984) measuring the frequency of finding humor in everyday situations, were used as predictors of the deleterious effects of stress. Regression analysis indicated that both measures of humor use acted as moderators for depressive but not for anxiety symptomatology. Participants with a good sense of humor who experienced high levels of stress between sessions one and two (as measured by the LES) recorded significantly lower BDI scores than those with a less developed sense of humor but with similar levels of stress. Because this was also reflected in the cross sectional data from session one, this study provides support, although qualified, for the idea that some of the negative effects of stress can be moderated by humor. With regard to the failure to predict anxiety, the authors hypothesized that the problem may have stemmed from labeling confusion on behalf of the participants and/or the temporal difference in depressive and anxious responses to stress. In the former case, the experience of anxiety and humor result in similar sympathetic arousal (Averill, 1969), which may have resulted in misinterpretation by some of the participants. In the latter explanation, the authors consider the difference between anxiety as an anticipatory buildup to a stressful event, and depression as a response subsequent to the event. In this way it may be that humor serves as a stress moderator only when people use it to cope with the actual occurrence but not the anticipation of the stressor.

Lefcourt, Davidson, Prkachin, and Mills (1997)) used a prospective design in which the same humor scales employed in the previous study (CHS and SHRQ) were used to predict negative effects of stress but this time using the objective measures of systolic and diastolic blood pressure as opposed to self-report measures of stress. The participants

were subjected to five consecutive stress-inducing tasks: 1) a challenging 12-minute structured interview assessing Type A personality (SI); 2) the Favorable Impressions task (FI), in which the subject is requested to converse with a member of the opposite sex with the goal of making as favorable an impression as possible while the other person (a confederate) remains totally impassive; 3) the Cold Pressor task (CP) in which participants immerse their arm in a circulating bath of ice water for as long as they can tolerate; 4) the Mental Arithmetic task (MA), requiring serial subtractions and 5) the Stroop Color-Word Test (ST), in which automatic processing causes "cognitive interference" when participants have to name colors of ink that are used to spell the names of conflicting colors. Analysis showed that in all five tasks, CHS scores interacted with sex in the prediction of higher blood pressure. Although less robust, SHRQ scores had similar predictive qualities. Therefore, regardless of trials (i.e., whether or not the stressor had begun) females who were higher on the humor scales recorded lower blood pressure readings than those who were lower on the humor scales. Conversely, males who scored higher on the humor scales, tended to have higher blood pressure readings than males who scored lower on humor.

Evidence to support the stress moderation effect of humor was found only with the CP task and only for the male participants as demonstrated by an interaction between humor and trials (i. e., high humor males had smaller increases in blood pressure as the stressful task progressed than their low humor counterparts). Though not a stress-moderator for females, Lefcourt et al. suggest that humor use may serve to decrease their baseline blood pressure levels, thus decreasing their risk for hypertension.

In reviewing the conflicting data, this study suggests that humor has a different effect depending on whether the user is male or female, further complicating the questions of whether humor acts as a stress moderator and, if so, how? Lefcourt et al. offer several possible hypotheses to account for the observed sex differences in humor coping. First, they refer to research that indicates that women tend to favor self-directed humor while men tend to favor other-directed humor. When Levine (1976) surveyed the contents of the material used by male and female stand-up comedians, she found that female comics preferred jokes that put themselves as the objects of the laughter (64% of all their jokes) as compared with male comics who seldom used self-directed humor (7% of jokes). This difference between male and female use of humor suggests that females may have a more adaptive approach. The ability to laugh or see humor in one's own failures could be a considerable benefit when attempting a difficult task. This attitude might allow female participants to approach an experiment or life situation as something less serious in which failures, instead of eliciting frustration, would be anticipated as topics for shared laughter with friends and the accompanying offerings of social support. If, on the other hand, men who score high on the humor scales are those who use a high degree of other-directed or hostile humor style, we might expect this to be associated with a higher degree of competitiveness, resulting in increased feelings of pressure and stress during the tasks.

Current Study

At this time there does not seem to be any consensus as to whether or not humor can provide a moderating influence on the negative effects of stress. For every study that supports the theory, another results in null findings. Recent research by Lefcourt et al. (1997) has added a new piece to the puzzle with the observation of a sex difference and

the new questions that this raises. What type of humor (i.e., self-directed vs. other-directed) is most likely to moderate the effects of stress? What are the essential ingredients for humor to be an effective coping strategy? If men employ a self-directed humor style, will there be a similar drop in cardiovascular reactivity?

To date, descriptive and correlational studies have been the designs of choice, with a few notable exceptions such as the studies mentioned previously. The resulting lack of causal evidence has accordingly limited the impact of any findings.

The current study used a prospective, experimental design to examine the effectiveness of self-directed humor as a coping technique. Participants were assigned to either a control condition or to various combinations of stress and humor treatment conditions, during which changes in cardiovascular reactivity (CVR) and mood were measured. The success of the humor treatment conditions was determined by the extent and direction of changes in CVR and mood. Evidence was also gathered to help answer the question of whether or not humor actually functions as a moderator of stress.

General Hypotheses:

1. Participants in the Stress conditions will show higher CVR measures and increased mood disturbance (POMS scores) following exposure to the stressor than participants not exposed to the stressor.
2. Humor will have a stress-moderating effect that will be reflected in smaller increases in CVR and less negative mood change among those in the humor treatment conditions compared to participants not exposed to the humor treatments.

3. Because the humor treatment will involve the use of self-directed humor only, the stress-moderating effects of humor should be similar for males and females.
4. Among both males and females, scores on the humor questionnaires (CHS and SHRQ) will be negatively correlated with CVR and mood disturbances during the stressor, demonstrating that humor will have a greater stress moderating effect among people who use humor more frequently.
5. Among participants exposed to both the stressor and humor treatment, the degree to which they are able to engage with the humor treatment will be negatively correlated with increases in CVR and mood disturbance.

Method

Participants

Participants were 59 students, 21 males and 38 females enrolled at Acadia University. They were recruited primarily from the Introductory Psychology Subject Pool and given two course credits for their participation. Additional participants were recruited from the Acadia University student population via announcements in classes and posters. All of the participants' names were entered in a draw for a cash prize of $100. Recruitment posters specified that the participants must be in good health as the study would involve the inducement of stress. The nature of the tasks and the research was described prior to the experiment to ensure informed consent. Participants were assigned to the four treatment conditions in a semi-random manner, according to the order in which they could be reached by phone.

Materials

Coping Humor Scale (CHS; Martin & Lefcourt, 1983).

The CHS consists of seven items designed to measure the extent to which the individual deliberately uses humor as a method of coping with stressful situations. Responses are scored on a 4-point, Likert scale. Participants are asked to express their level of agreement with each of the 7 items, ranging from "strongly disagree" to "strongly agree". Items include statements such as, "I often lose my sense of humor when I am having problems" and "I have often found that my problems have been greatly reduced when I try to find something funny in them." The typical mean score is 20, with average standard deviations of 3.5. Alphas range between .60 and .70 (Lefcourt & Martin, 1986).

Situational Humor Response Questionnaire (SHRQ; Martin and Lefcourt, 1984)

The SHRQ was developed to quantify the ability of participants to find humor in a variety of situations, some of which might not be very conducive to humor. The SHRQ assesses "emotion- focused" coping in that emotional distress is avoided by the ability to see humor in the face of a stressful situation. In the questionnaire, participants are asked to remember similar situations to the ones described in the item and state to what degree they would be able to find humor under those circumstances. Responses are recorded on a 5-point scale ranging from "I would not have been amused", to "I would have laughed heartily". An example of one of these items describes a situation in which the participants, thinking that they have recognized a friend in a crowded room, attract the person's attention then hurry over to them. When they get there they discover they have made a mistake and the person is a total stranger. The last three questions on the 21-item scale are slightly different, consisting of self-descriptive statements regarding styles of humor.

The average score for the scale is 60, with the mean standard deviation of approximately 9. Alphas typically range from .70 to .79 (Lefcourt & Martin, 1986). In differentiating the CHS and the SHRQ, Lefcourt et al. (1997) describe the CHS as a measure of humor as a "problem focused coping device", in contrast to the SHRQ which they describe as a measure of general sense of humor.

Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971)

The POMS is a 65-item self-report scale designed to identify and measure transient, fluctuating mood states by rating adjectives on a 5-point intensity scale. The target population for the test is an adult outpatient or non-psychiatric population with grade seven or higher education, in a research or clinical setting. The test is made up of six sub-scales: 1) tension-anxiety, 2) depression-dejection, 3) anger-hostility, 4) vigor-activity, 5) fatigue-inertia, and 6) confusion-bewilderment. Test-retest reliability correlations range from .65 to .74 (McNair et al., 1981). For the purpose of this study, participants used the nine items from the tension-anxiety sub-scale only. In this sub-scale, participants employ a 5-point Likert scale to describe to what degree each anxiety related adjective describes how they are feeling at that specific point in time.

Stressor

The stressor had to be one that could be introduced while the participants were being exposed to the humor video without interfering with their attention to the visual stimulus. For this reason the traditional methods were not suitable An auditory stressor was therefore designed that would adversely affect CVR and mood and, at the same time, could be effectively paired with the videos. In pilot studies, a recording of an infant crying resulted in the highest CVR increases and mood disturbances when compared to various

other sound effect recordings including traffic noises, intermittent high frequency sounds, and construction noises.

In the current study, stress was induced by playing a 10-minute recording of a two-year-old infant crying (recorded from the BBC Sound Effects Library). The recording was played through two Roland 25 Watt speakers with a peak sound pressure level (SPL) of 90dB. Sound level was monitored by a portable SPL meter and was set well below hazardous exposure levels (Sternberg, 1995). In order to ensure as equal as possible SPL for the participants, each participant was seated at a table, five feet from the speakers, which were mounted on a stand at a height of four feet.

Humor treatment

The humor treatment consisted of two phases, a humorous video (phase 1) and a short writing task (phase 2). The video consisted of a scene from the "Mr. Bean" series edited to be approximately 5 minutes in length. In order to allow both male and female participants to relate to the content, the "Mr. Bean" sketch was chosen to be relatively gender neutral in that the events portrayed could as easily occur to either males or females. The video contained exclusively the self-directed style of humor (i.e., the scenarios involved humorous events being directed at the protagonist as opposed to others). As the stressor soundtrack would interfere with any dialogue on the humor video, material was selected to contain only visual humor in order to eliminate the need for a soundtrack. The chosen sketch consisted of a sequence of comical scenes that revolved around Mr. Bean losing his swimming trunks when diving off the high diving board at a public swimming pool. This sketch rated the highest subjective humor ratings among various comic routines, Candid Camera reruns and humor videos that were piloted.

After the video, participants were requested to spend 5 minutes writing a hypothetical letter to a friend describing the content of the video from the perspective of the central character, as though the events had happened to them personally. Participants were instructed to imagine the response they might expect from their friends to the letter in order to replicate the potential benefits of peer support.

Physiological Measures of Stress

Cardiovascular reactivity (CVR), as reflected by changes in heart rate and systolic blood pressure, was used to measure physiological response to stress. These measures were chosen because of their demonstrated validity and reliability in prior studies (Lefcourt et al, 1997; Averill, 1969). Heart rate (HR) and systolic blood pressure (BP) were monitored by means of five Marshal model 92, combination blood pressure and heart rate monitors. In order to maximize validity and minimize any fluctuations due to anxiety caused by the measurement procedure ("lab coat effect"), this model employed an auto inflation feature and digital display, so that the participants could measure and record their own levels (overseen and checked by the researcher).

Procedure

As part of the recruiting process (Appendix A), participants were informed that BP and HR measures would be taken at three points in the study. In order to facilitate accurate measures participants were, therefore, requested not to wear bulky sweaters or sweatshirts. In order to reduce the likelihood of including the confounding effects of caffeine, alcohol, or nicotine on measures of cardiovascular reactivity (CVR), participants were also asked not to consume any nicotine containing products for 30 minutes, and alcohol or caffeine containing beverages for 4 hours before the start of the study. Upon

arriving at the laboratory, the nature of the study was reviewed, the procedure explained, and participants read and signed their consent forms (Appendix B). After consent forms had been signed, participants were given a short questionnaire to determine when each participant had last consumed substances that might affect CVR or mood (Appendix C). All participants reported following the protocol instructions regarding prior consumption of nicotine, caffeine, and alcohol.

After arriving at the lab, participants spent 30 minutes acclimatizing to the environment in order to limit the effects of stress caused by the lab setting and any pre-study physical exertion effects. During this period the researcher performed four activities: 1) explained the nature of the study, 2) familiarized the students with the BP monitor's operation and data recording, 3) witnessed signing of consent forms, and 4) assisted with filling in forms for Introductory Psychology bonus marks and ballots for the cash prize draw. Also during this time, humor coping and baseline mood levels were measured using the CHS , SHRQ and anxiety scale from the POMS respectively. The participants were then exposed to a brief (5-second), low volume sample of the stressor (to reduce any anxiety that might occur due to anticipation of the stressor). During the balance of the 30-minute period, participants were instructed to relax and given a simple word search task as a distraction from any anxiety-provoking thoughts. At the end of the acclimatization period (approximately 30 minutes after arrival at the lab), baseline measures of BP, HR, and mood were collected and recorded. Participants were tested in groups of five. The group testing method was chosen as it would facilitate laughter during the humor treatment and the group size of five was dictated by availability of monitoring

equipment. According to the group to which participants had been assigned, the procedure continued as follows:

1) Stress and Humor: Upon completion of the half-hour acclimatization period and collection of baseline data, Stress and Humor (S-H) participants received the humor treatment described above, paired with the stressor soundtrack. The soundtrack continued through both phases (video and letter-writing) of the humor treatment until the end of the final, post-treatment measures. BP, HR, and POMS measures were taken three times: at the end of the acclimatization period, following the video, and following the letter-writing period.

2) Stress with No Humor: The Stress with No Humor (S-NH) condition acted as a control for the effectiveness of the stressor. As such, the participants experienced the same procedure as the S-H group with the exception that the content of the video and the letter writing assignment was neutral rather than humorous. As a control group, they watched a 5-minute neutral video on the functioning of the human ear after which they were instructed to write a hypothetical letter to a friend describing the video. As with the S-H group, the stressor soundtrack was played from the start of the video until the end of post-treatment measures. BP, HR, and POMS measures were taken at the end of the acclimatization period, following the video, and following the letter-writing period.

3) No Stress with Humor (n=12): The No Stress with Humor group (NS-H) acted as a control group for the humor treatment condition (i.e., to control for mood and CVR changes that may occur as a result of exposure to humor). Participants followed the same procedure as the humor treatment group (S-H), viewing the same humor video and with the same letter writing instructions, but they were not exposed to the stress soundtrack.

As with the other conditions, BP, HR, and POMS measures were taken at the end of the acclimatization period, following the video, and following the letter-writing period.

4) No Stress and No Humor (n=16): The No Stress and No Humor condition (NS-NH) controlled for changes in CVR and mood generated by the experimental procedure. Participants viewed the neutral video and wrote a letter describing the contents of the video. They were not exposed to the stress soundtrack. Again, BP, HR, and POMS measures were taken at the end of the acclimatization period, following the video, and following the letter-writing period.

In order to assess changes in CVR and mood over the course of the procedure for the four conditions, BP, HR, and mood were measured at three times during the study: 1) baseline measures were taken after the 30-minute acclimatization period; 2) at the end of phase 1, consisting of the 5-minute video presentation (humor or neutral); and 3) after phase 2, consisting of the 5-minute letter writing task. Once the baseline measures had been recorded, the procedure continued according to the experimental condition being tested. For those in the humor treatment conditions (S-H and NS-H), during phase 1 participants were exposed to the 5-minute video depicting self-directed humor. Prior to viewing the video clip, to encourage the use of self-directed humor, participants were instructed to try to imagine themselves in the position of the recipient of the humor (central character). After watching the video, BP and HR were measured again and the Anxiety-Tension scale of the POMS was re-administered. Following these measures, during phase 2, participants were requested to spend 5 minutes writing a hypothetical letter to a friend describing the content of the video while still maintaining the perspective of the central character. In order to simulate the social support benefits of humor, while

writing the letter, participants were instructed to imagine the response of their friends to the letter. On completion of phase 2, final measurements of BP, HR, and mood levels were recorded.

The stressor sound track began with the start of the video and continued, through both phases 1 and 2, to the end of post-treatment testing. For those in the No-humor treatment conditions (S-NH and NS-NH), the neutral video depicting the functioning of the human ear was substituted for the "Mr. Bean" skit during phase 1. When these participants came to the letter writing segment of the study (phase 2) they were simply instructed to write a letter to a friend, describing the content of the video as closely as they could remember.

In order to obtain feedback and assess the effectiveness of instructions, after completing the final measures, participants were requested to use a 10-point scale in rating the following (see appendix D): 1) the humorousness of the video, 2) participants' ability to identify with the central character, 3) participants' ability to imagine their friends' responses to the letter, and 4) how annoying they found the stressor soundtrack.

Before leaving the study, all participants were presented with a debriefing summary (Appendix E), that contained a short explanation of the theories that were being tested, results of prior research, and suggested sources of further information. The debriefing form also outlined the normal ranges for systolic and diastolic BP and recommended contacting a physician if BP readings exceeded this range.

Results

General Approach to Data Analysis

An alpha level of .05 was used as the criterion for significance in analyses (except where noted) and only those results that met this criterion are reported in the text; summary tables for analyses can be found in the appendices.

Preparatory Analyses

First, the scores of outliers were identified. Second, the assumption of normality was determined and confirmed on the basis of the degree of skewness and kurtosis for each variable. The total n of 62 was reduced to 59 after the deletion of data for three participants who arrived more than 15 minutes late. A total of five outliers, defined as data points more than two standard deviations away from the mean (i.e., z-score > 2), were identified among both BP and HR scores. Since MANCOVA is sensitive to extreme outliers (Tabachnick & Fidell, 1996), the outliers' scores in each case were replaced with scores calculated to be two standard deviations away from the mean. In all cases the new score was still the most extreme score of the group on the variable in question. The chosen technique is more conservative than the method proposed by Tabachnick and Fidell (1996) who suggest replacing the outlying score with a value one unit higher than the next highest score on that measure. As replacing outliers with less extreme scores, in some cases, would have decreased the stress response measures of the humor treatment group, the more conservative method was chosen in order to reduce the likelihood of Type I error.

Skewness and kurtosis values were calculated for each variable. Those with skewness and/or kurtosis z-scores greater than 3.0 were considered to violate the assumption of normality required for ANOVA (Tabachnick & Fidell, 1996). Once the outliers had been replaced with less extreme values, there was no significant skewness or kurtosis in the distributions of any of the variables.

As the groups were of unequal size, Box's M test was used to check for homogeneity of variance-covariance. With the exception of the CVR change scores (differences between baseline, phase 1, and phase 2 of the treatment conditions), all variables were within the acceptable range ($p < .001$). As it was not possible to equalize cells by deleting random cases (too small an n), Pillai's Trace was used as an adjusted criterion to evaluate multivariate significance (Tabachnick & Fidell, 1996) in order to reduce danger of inflated Type I error.

Control Variables

To ensure that groups did not differ on potentially confounding factors, chi-square analyses were conducted on the following three variables: Sex (to ensure that there was not a disproportionate number of males or females in any of the conditions), smokers vs. non-smokers, and medication (proportions of participants in each group currently using prescription or non-prescription drugs). None of the participants reported the use of nicotine, alcohol, or caffeine-containing products during the required pre-study period of abstinence. All chi-square analyses were non-significant.

Comparison of baseline levels of the dependent variables

Between group, one-way ANOVAs were carried out for each of the baseline dependent variables (BP, HR, and POMS scores) to determine whether there were any

pre-existing differences on these measures between the participants in the various experimental conditions and between genders (see Appendix G). Each independent variable was examined separately (Stress, Humor, and Sex), collapsed across the other two variables (e.g., baseline differences in BP were compared between the Stress and No Stress conditions collapsed across Humor treatment and Sex). Baseline measures of BP were found to be significantly higher in the No Stress condition ($n = 28$) than in the Stress condition ($n = 31$), $F(1, 57) = 6.41$, $p = .01$. Males had higher baseline BP than females [$F(1, 57) = 14.42$, $p = .00$], and females had significantly higher baseline HR than males [$F(1,57) = 6.77$, $p = .01$.)].

In order to factor out these pre-existing differences, baseline BP was included as a covariate in the between-groups comparisons (MANCOVA) and in the multiple regression analyses. As Sex was not included as an independent variable in the MANCOVA, baseline HR, which differed across sexes only, was not used as a covariate in the MANCOVA. However, baseline HR was entered into the multiple regression analysis that was used to examine sex differences in humor coping.

Between Groups Comparisons

A 2 (Stress) x 2 (Humor) MANCOVA was conducted separately for each of the three types of dependent measures (i.e., two dependent variables representing changes in BP, two dependent variables representing changes in HR, and two dependent variables representing changes in POMS scores) between participants who were exposed to the two levels of humor treatment (humor vs neutral video), and the two levels of the stressor (noise vs. no noise). In order to control for inflated Type I error due to carrying out three separate MANCOVAs, a more conservative alpha level of .017, based on a Bonferroni

correction, was chosen for these analyses. Each MANCOVA tested for the main effects of the independent variables (Humor and Stress) as well as possible interactions that might indicate a stress moderating effect of humor. The two dependent variables that were used for each analysis (HR, BP, and mood) were change scores that represented differences over phase 1 (between the baseline HR, BP, and mood measures and those taken following the video), and change scores that represented differences over phase 2 (between HR, BP, or mood measures at the end of the phase 1 video and those taken at the end of the phase 2 writing task). Phase 1 change scores were calculated by subtracting the value obtained at baseline from that obtained at the end of phase 1, and phase 2 change scores were calculated by subtracting the value obtained at the end of phase 1 from the value obtained at the end of phase 2. Due to linear dependence, the variables representing change from the baseline measures to those taken at the end of phase 2, for each of the three dependent measures, could not be included in these analyses (i.e., these values were composites of phase 1 and phase 2 change scores). Because the one way ANOVAs for baseline differences described in the previous section indicated significant baseline differences in BP, this measure was included as a covariate in the MANCOVA in order to control for the effects of these differences. Analysis without using covariates yielded the same results as those found below.

The three separate MANCOVAs were done as follows: 1) for the two BP measures (change over phase 1 and change over phase 2), 2) the two HR measures (change over phase 1 and change over phase 2), and 3) the two POMS measures (change over phase 1 and change over phase 2). Separate MANCOVAs both increased power and, as the dependent variables sometimes were affected in different directions, clarified

interpretations of multivariate analyses, making it possible to see the direction of each effect.

Using the Pillai's Trace criterion, the 2 (Stressor) x 2 (Humor) MANCOVA for change in mood over phase 1 and change in mood over phase 2 showed that the stressor had a significant main effect on the POMS change scores, $F(2, 48) = 13.44$, $p = .00$. Inspection of the means, as shown in Table 1, indicates that the stressor succeeded in inducing a stress response with regard to mood. No other significant effects or interactions were found. Follow up univariate ANCOVAs showed that the specific time period in which the Stressor and No-Stressor conditions differed in terms of POMS scores was over phase 1 (between baseline and the end of the 5-minute video), $F(1,51) = 27.24$, $p = .00$. As this significant difference between stress conditions was the result of a greater increase in POMS scores within the Stress condition compared to the No-stress condition, this suggests that the stressor was successful in producing increased subjective feelings of anxiety over the first phase of the procedure. No significant difference, however, was found between humor conditions.

Within groups comparisons

In order to perform manipulation checks on the effectiveness of the Stress and Humor treatments, paired t-tests were conducted within groups between baseline and post-treatment scores on HR, BP, and mood measures (i.e., actual scores taken at baseline, the end of phase 1 and the end of phase 2). Three of the four experimental conditions (the S-NH, NS-H, and NS-NH groups) were designed specifically to isolate any effects of the treatments (Humor and Stress) or the experimental environment. These manipulation checks were designed to test whether there were significant changes in the

Table 1

Mean changes in CVR and mood across treatment conditions

Group	BPch1 phase1	BPch2 phase2	HRch1 phase1	HRch2 phase2	POMSch1 phase1	POMSch2 phase2
S-H	-1.40	2.07	6.20	-4.07	4.60	1.27
	(5.84)	(4.71)	(10.80)	(7.00)	(5.53)	(2.84)
S-NH	.33	.17	3.42	-1.25	7.17	1.08
	(8.23)	(6.51)	(5.85)	(7.24)	(7.49)	(5.00)
NS-H	-4.94	.81	.75	.63	-1.44	1.19
	(7.93)	(5.62)	(6.19)	(6.79)	(1.90)	(1.94)
NS-NH	-8.37	.25	-2.25	-1.19	-2.63	.50
	(10.80)	(11.30)	(12.89)	(5.55)	(2.09)	(1.79)

Note: Standard deviations in parentheses. BPch1 = change from baseline to measure 2 (phase 1); BPch2 = change from measure 2 to measure 3 (phase 2).

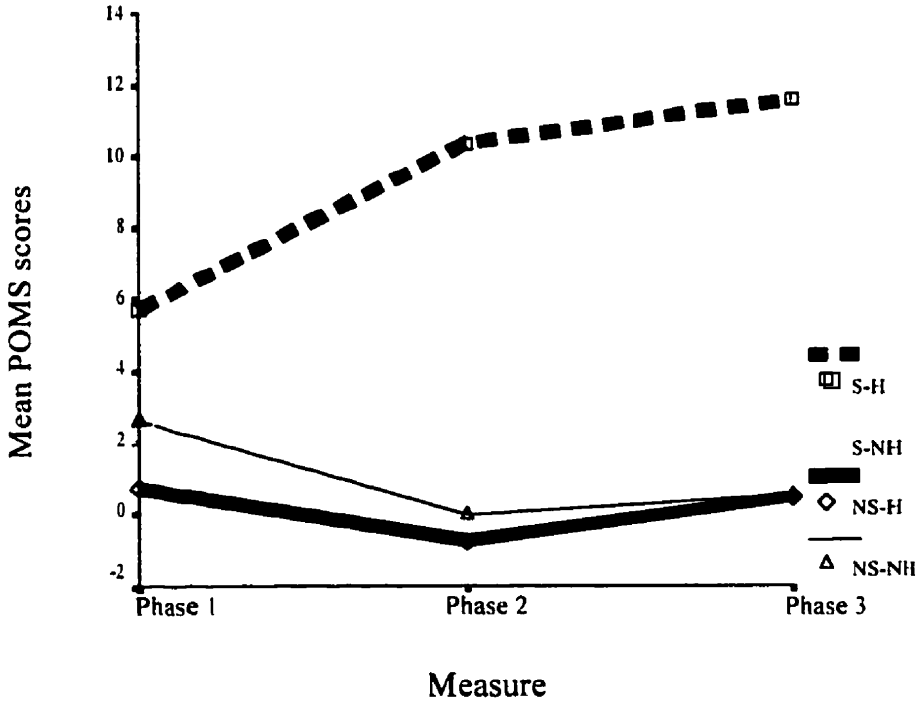

Figure 1. Changes in mean POMS scores over time by treatment group.
Note. S-H = Stress-Humor
S-NH = Stress-No Humor
NS-H = No Stress-Humor
NS-NH = No Stress-No Humor

dependent variables between the baseline measures and those taken after the two phases of treatment.

Paired t-tests within the S-NH condition, a control group for the effectiveness of the stressor, indicated that although increases in HR and BP did not reach significant levels, the stressor did significantly elevate POMS scores over both phase 1 and the combined period of phases 1 and 2, $t(11) = -3.313$, $p = .01$ and $t(11) = -2.85$, $p = .02$, respectively (see Figure 1). POMS scores did not, however, change between the end of phase 1 and the end of phase 2.

The NS-H condition was included in order to control for mood and CVR changes that may have occurred as a result of exposure to humor alone. As the physiological responses to laughter include increases in respiration and HR (Averill, 1969), it was important to examine the effects of laughter caused by the humor condition. Within group t-tests indicated that humor exposure produced a decrease in BP over both phase 1 and the combined period of phases 1 and 2, $t(15) = 2.49$, $p = .03$ and $t(15) = 2.71$, $p = .02$, respectively (see Figure 2). BP did not, however, change between the end of phase 1 and the end of phase 2. Although HR showed no change, POMS scores decreased significantly over phase 1, $t(15) = 3.03$, $p = .01$, as shown in Figure 1. The humor video responsible for these changes received moderate ratings of humor content as evaluated on the post-study questionnaire (M=7.26 on a scale of 10).

The NS-NH condition controlled for changes in HR, BP and mood generated by the experimental procedure. Within subjects t-tests showed that in these participants, who were not exposed to either the stressor or humor treatments, BP decreased over phase 1 only, $t(15) = 3.10$, $p = .01$ as shown in Figure 2, while POMS scores decreased over both

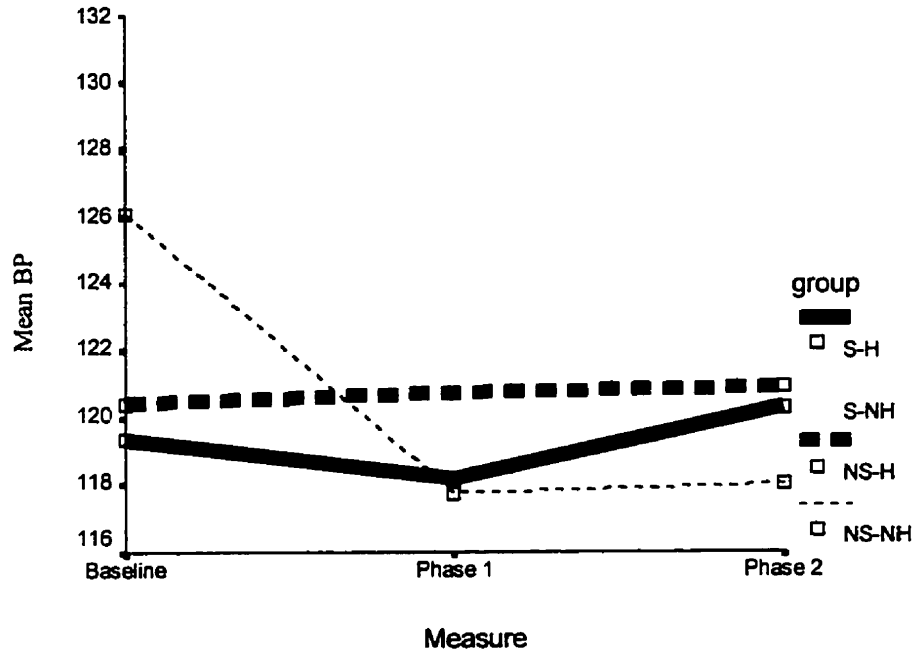

Figure 2. Changes in mean BP measures over time by treatment group.
Note. S-H = Stress-Humor
S-NH = Stress-No Humor
NS-H = No Stress-Humor
NS-NH = No Stress-No Humor

phase 1 and the combined period of phase 1 and 2, $t(15) = 5.02$, $p = .00$, and $t(15) = 2.91$, $p = .01$, respectively, as shown in Figure 1, but did not change between the end of phase 1 and the end of phase 2. This suggests a possible acclimatization effect, as the participants grew gradually more comfortable with their surroundings.

Relation between humor scales (SHRQ and CHS) and stress response

In order to explore the relation between use of humor in everyday situations and response to the experimental stressor, correlations were carried out between humor use measures (SHRQ and CHS) and the stress response measures (see Table 2). Among males, CHS scores were only correlated with increases in HR over the two phases combined (i.e., change from baseline to the end of phase 2), $r(57)=.50$, $p=.02$. This positive relationship indicates that males who reported using humor more often experienced increases in HR across the two phases of the study. There was also a positive relationship between humor use and HR among females. Both SHRQ and CHS scores were correlated with increases in HR over phase 2 of the study, $r(57)=.43$, $p=.01$ and $r(57)=48$, $p=.00$, respectively. These results suggest that female participants who were more frequent users of humor had increases in HR during the writing task.

When examining the correlations for each of the four separate treatment groups, similar relations are found. In the NS-H group, both humor measures (SHRQ and CHS) were significantly related to combined phase 1 and phase 2 HR, $r(10)=.52$, $p=.04$ and $r=.53$, $p=.03$ respectively. In the NS-NH group, both CHS and SHRQ were significantly related to phase 2 HR, $r(14)=.81$, $p=.00$, and $r(14)=.68$, $p=.00$ respectively.

Table 2

Pearson Product-moment correlations between humor use measures (CHS and SHRQ) and measures of stress response for males and females

	1	2	3	4	5	6	7	8	9	10	11
					Males (n=21)						
1	--	.60**	-.15	-.12	-.03	.08	.34	.28	-.02	-.09	-.17
2	--	--	.33	.27	.07	.24	.50*	.21	-.08	-.14	-.17
					Females (n=38)						
1	--	.59**	.16	.13	-.07	-.21	.09	.43**	.06	.11	.17
2	--	--	.01	.05	.06	-.29	.04	.48**	.13	.18	.19

Note $p<.05$ *, $p<.01$ **

1. SHRQ
2. CHS
3. Change in BP over phase 1
4. Change in BP over phase 1 and 2 combined
5. Change in BP over phase 2
6. Change in HR over phase 1
7. Change in HR over phase 1 and 2 combined
8. Change in HR over phase 2
9. Change in POMS over phase 1
10. Change in POMS over phase 1 and 2 combined
11. Change in POMS over phase 2

Relation between participants' ability to engage in humor treatment and stress response

In examining the relation between the participants' ability to imagine the responses of their friends to the letters describing the embarrassing situation and the stress response measures, a significant association was found with measures of mood disturbance (increase in POMS scores). Participants' ratings of their ability to imagine this response correlated negatively with changes in mood disturbance between baseline measures and the measures taken at the end of phase 2 (i.e., change over phase 1 plus phase 2), $r(57)=-.55$, $p=.03$. This supported the hypothesis that thinking about a friend's supportive responses to the participant's misfortunes reduced the effects of the stressor.

Multiple regression

Due to difficulty in recruiting male participants, the NS-NH group contained only 3 males and 13 females. Although this did not constitute a significant difference in the chi-square test, the assumptions of MANCOVA would not be met with such a small number. Therefore, it was determined that multiple regression would be a more appropriate method for examining sex differences in changes in BP, HR, and mood.

The contribution of Sex towards the prediction of change in BP, HR and mood was analyzed using hierarchical multiple regression analysis. Separate regressions were run for each of the change scores representing changes over phase 1 and phase 2 for each of the measures (BP, HR, and mood) for a total of six regression analyses. In order to factor out baseline differences between males and females in BP and HR, baseline BP and HR were entered together in step one. Humor and Stressor were added at step 2 of the analysis. In order to determine the effects of Sex, independent of the preceding factors, it was entered

Table 3

Multiple Regressions of Treatment Conditions and Sex on HR, BP, and POMS

Hierarchical Regression of Treatment Conditions and Sex on Changes in BP over Phase 1

Step	Predictor	R^2 change	F change	Beta (at step 6)
1	HR 1	.21	7.50**	-.14
	BP 1			-.47**
2	Humor	.05	1.69	.22
	Stressor			.43
3	Sex	.02	1.46	.20
4	Stress x Sex	.03	2.19	-.39
5	Humor x Sex	.01	.42	.11
6	Stress x Humor x Sex	.01	.80	-.61

N=59

*p<.05, **p<.01, ***p<.001

Hierarchical Regression of Treatment Conditions and Sex on Change in BP over Phase 2

Step	Predictor	R^2 change	F change	Beta (at step 6)
1	HR 1	.02	.43	-.26
	BP 1			.27
2	Humor	.01	.16	-1.34**
	Stressor			-.71
3	Sex	.12	7.06*	-.92
4	Stress x Sex	.02	1.38	.72
5	Humor x Sex	.11	7.70*	1.65
6	Stress x Humor x Sex	.00	.08	.10

N=59

*p<.05, **p<.01, ***p<.001

Table 3 (continued)

Hierarchical Regression of Treatment Conditions and Sex on Change in HR over Phase 1

Step	Predictor	R^2 change	F change	Beta (at step 6)
1	HR 1	.26	10.04***	-.47**
	BP 1			-.08
2	Humor	.04	1.65	-.43
	Stressor			.17
3	Sex	.01	.52	.21
4	Stress x Sex	.01	.78	-.61
5	Humor x Sex	.01	.61	.37
6	Stress x Humor x Sex	.00	.03	.11

N=59

*p<.05, **p<.01, ***p<.001

Hierarchical Regression of Treatment Conditions and Sex on Change in POMS over Phase 1

Step	Predictor	R^2 change	F change	Beta (at step 6)
1	HR 1	.04	1.07	.01
	BP 1			.02
2	Humor	.39	18.09	.15
	Stressor			-.79
3	Sex	.00	.01	-.44
4	Stress x Sex	.00	.03	.81
5	Humor x Sex	.00	.15	.51
6	Stress x Humor x Sex	.02	1.99	-.86

N=59

*p<.05, **p<.01, ***p<.001

in the third step. Finally steps four, five, and six contained the interaction terms (Stress x Sex, Humor x Sex, Humor x Stress and Stress x Humor x Sex).

As was expected baseline BP and HR were significant predictors of BP change over period one $F(2,56)=7.50$, $p<.01$ (see Table 3). This suggested a ceiling effect created by high baseline BP measures in the two No Stress groups. Starting with such high baselines, the levels could only fall. Baseline BP and HR were also significant predictors of HR change over phase 1, $F(2,56)=10.04$, $p<.01$. Sex was a significant predictor of BP change over phase 2, $F(1,53)=7.06$, $p=.01$, and also interacted with Humor as a significant predictor of BP over phase 2, $F(1,51)=7.69$, $p=.01$, accounting for a change of 12% and 11% of the variance, respectively. The main effect of Sex reflected the fact that males experienced decreasing BP over phase 2 compared with increases in the females. Examination of the interaction indicated that males in the neutral video conditions experienced decreases in BP while female participants experienced little change regardless of humor treatment (see Figure 3). The combination of Stress and Humor (entered together) was a significant predictor of mood change over phase 1, $F(2,54)=18.09$, $p<.01$, accounting for a change of 39% of the variance. Examination of the individual beta weights showed that only Stressor was a significant predictor of mood change over phase 1, consistent with the findings of the MANCOVA.

Post-test Questionnaires

The overall mean rating of the humor video was 7.03 on a 10 point likert scale (Appendix D), with no difference between sex or treatment conditions. This was lower than hoped for but still indicated that participants found the sketch quite humorous. The

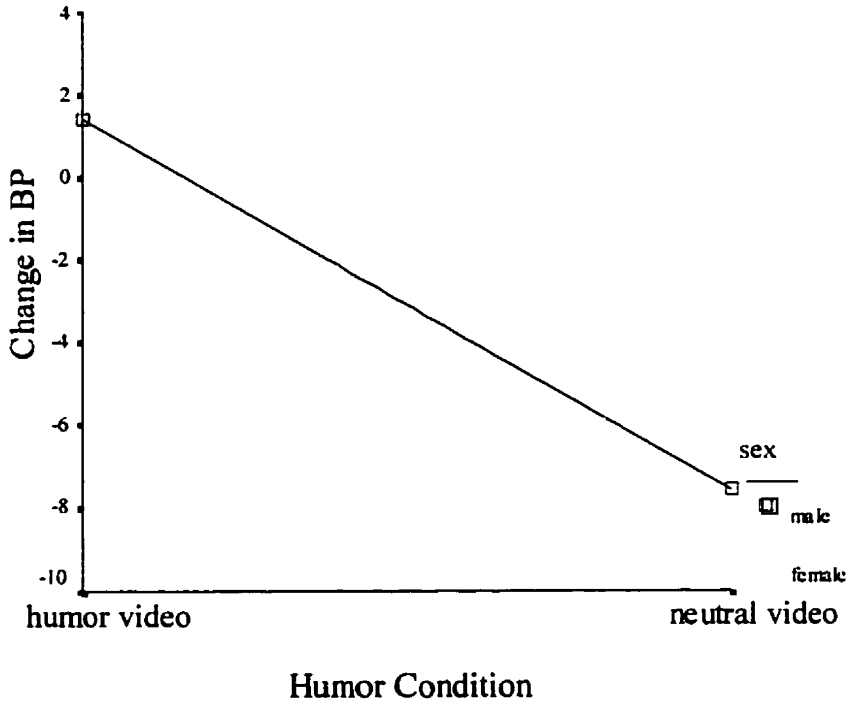

Figure 3. Mean change in BP over phase 2 as a function of Humor treatment and Sex.
Note. S-H = Stress-Humor
S-NH = Stress-No Humor
NS-H = No Stress-Humor
NS-NH = No Stress-No Humor

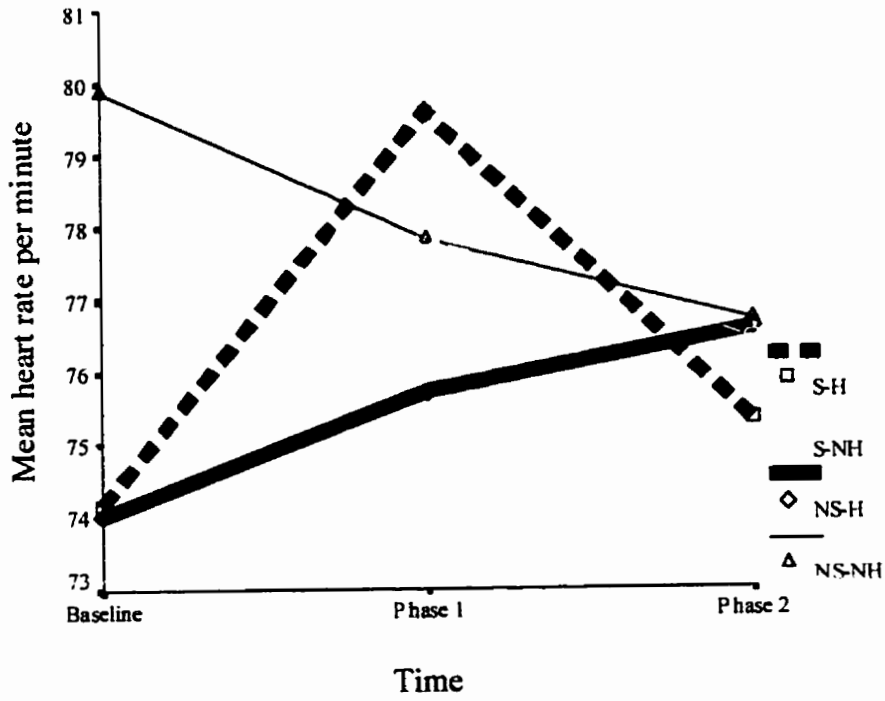

Figure 4. Changes in mean HR over time by treatment group.

Note. S-H = Stress-Humor
S-NH = Stress-No Humor
NS-H = No Stress-Humor
NS-NH = No Stress-No Humor

stressor faired better with an overall mean rating of 8.07 on a scale with 10 indicating that the noise was found to be extremely annoying. Although there was no difference between treatment conditions, females found the stressor less annoying, subjectively, than the males, $t(24.07)=2.13$, $p=.04$. Not unexpectedly the participants who viewed the Mr. Bean video found it easier to imagine the responses of their friends to their letters describing that video than the participants who watched the video describing the functioning of the human ear, $t(41.57)=2.66$, $p=.01$. The overall mean for the participants' ability to imagine their friends' responses to their letter was 6.59 with no sex difference, indicating moderate success with these instructions. Participants apparently had more difficulty attempting to identify with the central character of the video as the overall mean rating of this ability was 5.41. There was no difference between treatment condition or sex, indicating that males and females had similar difficulties identifying with the Mr. Bean character.

Discussion

Sex differences in humor coping

As was hypothesized, the success or lack of success of humor coping was the same for both sexes on all but one of the stress response measures. Regression analysis showed sex to be a significant predictor of BP changes over phase 2 (i.e., during the writing task), with males demonstrating a decrease in BP over this period while female participants showed a small increase. Although it had been anticipated that by using self-directed humor, male participants' humor coping success would be similar to that of the females, only the neutral writing task seemed to have a relaxing effect, and this was only evident in the male participants' BP changes. With this exception, neither sex achieved success from

the self-directed style of humor coping strategy. The most likely explanation for this lack of effect is that the humor treatment did not reach a sufficient intensity. The other possibility is that the humor condition failed to produce a close enough analogue of self-directed humor. Although the protagonist in the video was the recipient of all the humorous events, by causing the participants to become observers of these scenes, the humor may have then shifted to "other-directed".

Despite the participants being instructed to imagine that they were in the position of the central character, results from the post-study questionnaire show that this was only partially achieved (participants' mean ratings of their ability to identify with the protagonist scored only 5.41 on a 10-point scale). As much of Mr. Bean's humor is generated by his bizarre appearance and eccentric character, these very qualities may well interfere with the ability of participants to identify with such a figure. Selection of a less ludicrous central character and a more realistic situation may help to reduce this difficulty in future research.

Stress moderating effects.

The results failed to support the hypothesis that the humor treatment would have a moderating effect on the stress response as shown by the absence of an interaction between Stress and Humor. One possible explanation for this lack of effect is the occurrence of empathy. As participants were instructed to imagine themselves in the position of the central character, it is possible that the empathy that they felt with the protagonist's highly embarrassing situation overshadowed the beneficial effects of the humor. Although the humor only control group did not show any significant evidence of increased mood disturbance or CVR, the feelings aroused by their empathy may not have

been tapped by these measures. If this was the case, the unexpected effect could either be avoided by omitting the instructions or changing the content of the video such that it would be less empathy provoking.

As was mentioned earlier, subjective measures of humor content and observation of participants during the video indicated that it was only found to be moderately amusing (i.e., no hearty laughter). It could be that the relatively low amount of laughter generated by the sketch did not reach a threshold necessary to achieve the expected stress moderating benefits. This suggests that any future attempts in this area of research must ensure that the selected humor treatment is capable of stimulating a higher degree of mirth.

Another explanation for the lack of a stress moderating effect of the humor treatment is that short-term arousing effects on the sympathetic nervous system caused by the laughter as described by Fry (1988), masked the expected results. Measures taken from the control group (NS-H), however, indicate that this was not likely the case as participants who were exposed to the Humor treatment only, without the stressor, showed no increases in CVR or mood. It is also unlikely (based on observation) that the laughter was vigorous enough to have an arousing effect on the sympathetic nervous system.

Stress moderating effects of humor coping as measured by CHS and SHRQ

Based on the research by Martin and Lefcourt (1983), which demonstrated that people who scored higher on humor use were less severely affected by stressful life events, it had been hypothesized that there would be a negative correlation between humor use scales (CHS and SHRQ) and stress response. Instead, only positive relationships were found and only between humor use and HR (for both males and females). One of the

possible explanations for failure to support the hypothesis could be the differences in study designs. Martin and Lefcourt based their conclusion of a stress moderating effect on the fact that high humor use scores predicted lower correlations between stressful life events and POMS scores. The current study, using a prospective design, attempted to examine the relationship between humor use and stress response by directly examining the correlations between these two variables. Martin and Lefcourt's use of the Life Events of College Students Scale (Sandler & Lakey, 1982), although retrospective, offered increased external validity through its use of real life events which also may have provided a wider spectrum/range of stress levels.

Stress Inducement.

The crying baby soundtrack was successful in affecting mood during the initial phase of the procedure. When Stress was collapsed across Humor conditions in the MANCOVA, the participants exposed to the stressor described significantly more feelings of tension, anxiety and edginess as compared to those participants who were not exposed to the stressor. This suggests that the stressor was successful in creating a stress response in terms of its effect on mood. Within the groups exposed to the stressor, POMS scores increased significantly from the onset of the stressor to the end of phase 1. The stress response, however, was not evident on any of the CVR measures, which, despite a general increase, did not reach significance. A possible explanation for this failure is that, although pilot studies showed significant increases in both CVR and POMS scores when participants were exposed to the 5-minute infant-crying soundtrack, these pilots were done without any video stimulus present. It is likely that without anything to distract their attention, participants in the pilot studies experienced greater impact of the stressor. In

the later experimental conditions, participants were able to focus on the video presentation and this may have helped them to shut out the auditory stressor. This interpretation coincides with informal feedback collected from several participants who described being able to "tune out" the noise after the initial few minutes. This is further supported by the patterns of both POMS scores and HR (see Figures 1 and 4) which show steep increases over phase 1 that either level off or decline over phase 2. This ability to "tune out" the noise is also a possible explanation for the difference in effectiveness of the stressor between phases 1 and 2.

A number of possibilities have been considered for improving the effectiveness of the stressor. Due to the benefits of convenience and ease of control in using an auditory stimulus, improving the effectiveness would be preferable to beginning with another inducement method. Research into noise pollution (Jones & Chapman,1984) shows that the three criteria which increase the stressfulness of noise in work environments are 1) a high frequency sound, 2) loudness, and 3) intermittent presentation (preventing attenuation). Although the current stressor was designed to meet these criteria, it is possible that it could be intensified in all three areas to produce a stimulus that could not be so easily ignored or "tuned out" by the participants. Other possible solutions involve changing the format of the treatment conditions. One option would be to make the humor treatment an auditory humor sketch and switch the stressor to the video medium in the form of stressful images. However, prior studies that have used this inducement method have relied primarily on showing shocking scenes of accidents and violence that would be difficult to justify ethically.

Humor Treatment

Between groups comparisons showed that exposure to humor alone, without the stressor, had no effect on CVR or mood, as expected. In fact, participants who experienced the humor video without the stressor responded similarly to those who experienced neither stress nor humor, as shown in Figures 1 and 2. Other researchers (White & Camerena, 1989) have suggested that the initial arousing effect of laughter may cause interference with anticipated effects. Both the MANCOVA results and observation suggest that this was unlikely to interfere with results in the current study as response to the video was characterized by subdued laughter and amused smiles rather than hearty "knee slapping" laughter evoked in the study by White and Camerena.

During piloting, other videos received more open and vigorous laughter but did not meet the criteria involving focus on strictly self-directed and visual humor. If a video could be found that was able to meet these criteria and also generate more vigorous laughter, it is possible an effect of humor would be obtained. Choosing a more sensitive dependent variable such as immune system functioning, which has been successfully employed by previous researchers (e.g., Martin & Dobbin, 1988; Berk, 1989), might also have picked up more subtle, beneficial effects of the humor treatment.

Attempts at creating a gender neutral humor treatment may have been compromised by the fact that there was only one researcher who was male. This may have caused increased anxiety in the female participants when writing descriptions of losing their bathing suits. This theory is supported by increased heart rates among females during phase 2.

Another interpretation of the experiment's failure to show a stress moderating effect is that no such ability of humor exists. Although this conclusion must be considered, the majority of research and anecdotal evidence does suggest otherwise.

Future Studies

Lack of results in the current study can be attributed partially to a small N, and partially to treatment conditions that were not of an intense enough nature to induce physiological effects. When considering potential stressors, future researchers should consider the successful procedures used by Lefcourt et al. (1997) including the Cold Pressor task and the Favorable Impression task. Although these were not practical with the current design, modifications could be made in order to accommodate such changes, such as switching to a pre or post-stressor humor treatment rather than the simultaneous presentations.

In terms of humor treatment, researchers will need one that is capable of provoking more vigorous laughter, while still meeting the other criteria of the design. This is likely to be the most difficult challenge for future researchers and will require piloting many selections in order to find one that can generate a strong response, with general appeal, self-directed content (sex-neutral), and with no need of soundtrack (if retaining the auditory stressor). Another option is to use a form of laughter meditation as explored by Sutorius (1995). This method involves coaching participants to laugh without any humor source other than the contagious effects of being in a group of people who are all laughing. This, however, would subtly change the focus of the research to the benefits of the laughter itself as opposed to humor and the resulting laughter.

Although this study did not support the theories of the stress moderating abilities of humor coping methods, this is nevertheless an area that demands much further study in order for it to be understood and hopefully applied to our current methods of preventing and reducing the effects of stress. As more and more relationships are being found between stress and threats to our health, research into natural ways that individuals can reduce these threats should be a high priority. Much of the research mentioned in the introduction suggests that it may be possible to harness humor in just such a way. Future studies should, therefore, focus not only on confirming these findings but also exploring ways to apply such knowledge. In order to do this, the following questions need to be answered: a) what are the properties of humor that reduce the harmful effects of stress, b) what types of humor work best, c) why does it seem to only work for certain people, and 4) what are the practical and most efficient ways of delivering these benefits?

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Appendix A

Pre-study Instructions

4 hours prior to study:
* **No** caffeine products (including chocolate, colas, tea or coffee)
* **No** alcohol

1/2 hour prior to study:
- **No** nicotine consumption (including nicotine gum)
- **No** extreme physical exertion (e.g., working out, running up the stairs, etc.)

As blood pressure readings will be taken during the study it is requested that participants not wear bulky sweaters or sweatshirts that will obstruct the blood pressure cuff.

Please try to arrive 10 minutes before the study begins in order to complete forms and ensure that we can begin on time.

Appendix B

Consent Form
Stress and Humor Study

Purpose and Procedure

The purpose of this pilot study is to examine humor as a coping strategy for stress. Participants will be required to watch a 10-minute video and write a brief description of what they have seen (5-minutes) while being exposed to a loud, intermittent tone or silence if they are in the control group. Blood pressure and mood level will be measured at three times during the experiment. During the beginning of the study, participants will also be asked to complete a word search task while waiting for the other tests.

Participants will receive 2 bonus marks towards their Introduction to Psychology mark for participating in the study and have their names put in a draw with a maximum of 60 other names for a cash prize of $100.

All collected information is confidential and is analyzed only as a group.

Statement of Informed Consent

I have read and understand the description of the study. To the best of my knowledge, I am in good health, have normal hearing, and do not suffer from heart disease, hypertension, hypotension or other circulatory problems.

I have been given a copy of this consent form and am aware that I am free to withdraw from the study at any time without penalty.

Date:_____

Signature of participant: _____

Signature of researcher: _____

Appendix C

Pre-test questionnaire

1) If you have smoked or used any nicotine products (nicorette gum, nicotine patch) during the last 24 hours when was the last time and what type of product?

Product type (cigarette, gum, etc):_____ Time:_____

2) If you have used any medication during the last 24 hours, what type was it and when was it last taken?

Type:_____ Time:_____

3) If you have consumed any caffeine products (chocolate, tea, coffee, cola, etc.) in the last 24hrs when was the last time? _____

Appendix D

Post-test Questionnaire

1) Please rate the preceding 5-minute video for humor content using the following scale:

Not at all funny — Very funny

0 1 2 3 4 5 6 7 8 9 10

2) To what extent were you able to identify with the central character (Mr.Bean) in the video?

Not at all — very closely

0 1 2 3 4 5 6 7 8 9 10

3) To what degree were you able to imagine your friend's response to your letter?

Not at all — very well

0 1 2 3 4 5 6 7 8 9 10

4) How annoying did you find the soundtrack of the baby crying?

Not at all — very annoying

0 1 2 3 4 5 6 7 8 9 10

Appendix E

Debriefing

You have just taken part in a study testing humor as a moderator of stress and comparing self-directed vs other-directed humor as coping methods. Research has suggested that females seem to be able to use humor more effectively than males in this regard (Lefcourt, Davidson, Prkachin, & Mills, 1997). A possible explanation for this is that women, who emphasise self-directed humor, receive more social support and are able to use this style of humor to minimize the source of stress. Men on the other hand, favour other directed humor that is less likely to foster social support and creates a more competitive atmosphere.

If you wish to read more on this subject a good source of information is the following article that was cited above:

Lefcourt, H.M., Davidson, K., Prkachin, K.M.,& Mills, D.E. (1997). Humor as a stress moderator in the prediction of blood pressure obtained during five stressful tasks. Journal of Research in Personality 31 (4), 523-542.

It is advised that if your systolic blood pressure exceeds 160 or your diastolic blood pressure exceeds 95 that you should consult your physician (these are the World Health Organisation standards for high blood pressure).

Appendix F

Summary of means and standard deviations for the four treatment conditions

Variable	Stress- Humor N=15	No stress- Humor N=12	Stress- No humor N=16	No stress- No humor N=16
BP 1 (Baseline)	119.47 (11.87)	120.42 (11.29)	131.00 (14.95)	126.13 (13.84)
HR 1 (Baseline)	73.07 (13.51)	74.17 (13.13)	75.38 (11.18)	80.19 (15.00)
POMS 1 (Baseline)	5.73 (8.9)	2.25 (6.85)	.69 (4.95)	2.63 (4.51)
BP 2 (measure 2)	118.07 (11.37)	120.75 (11.80)	126.06 (15.94)	117.75 (11.91)
HR 2 (measure 2)	79.27 (12.65)	77.58 (14.49)	76.13 (12.26)	77.94 (10.04)
POMS 2 (measure 2)	10.33 (6.85)	9.42 (8.07)	-.75 (5.12)	-2.78 (3.65)
BP 3 (measusre 3)	120.13 (10.62)	120.92 (10.44)	126.88 (15.70)	118.00 (14.8)
HR 3 (measusre 3)	75.20 (12.84)	76.33 (15.42)	76.75 (12.17)	76.75 (11.57)
POMS 3 (measusre 3)	11.60 (6.62)	10.50 (10.03)	.44 (5.05)	.50 (2.76)
BPch 1 (BP 2 – BP 1)	-1.40 (5.84)	.33 (8.23)	.4.94 (7.93)	-8.37 (10.80)
BPch 2 (BP 3 – BP 2)	.67 (3.83)	.50 (6.63)	-4.13 (6.10)	-8.13 (16.43)
BPch 3 (BP 3 – BP 1)	2.07 (4.71)	.17 (6.51)	.81 (5.62)	.25 (11.30)
HRch 1 (HR 2 – HR 1)	6.20 (10.8)	3.42 (5.85)	.75 (6.19)	-2.25 (12.89)
HRch 2 (HR 3 – HR 2)	2.13 (7.23)	2.17 (6.01)	1.37 (6.22)	-3.44 (13.72)
HRch 3 (HR 3 – HR 1)	-4.07 (7.00)	-1.25 (7.24)	.63 (6.79)	-1.19 (5.55)
POMSch 1 (POMS2-POMS1)	4.60 (5.53)	7.17 (7.49)	-1.44 (1.90)	-2.63 (2.09)
POMSch 2 (POMS3-POMS2)	5.87 (6.14)	8.25 (10.05)	-.25 (2.67)	-2.13 (2.92)
POMSch 3 (POMS3-POMS1)	1.27 (2.84)	1.08 (5.00)	1.19 (1.94)	.50 (1.79)
SHRQ	59.9 (7.24)	61.25 (6.63)	63.44 (8.48)	63.75 (11.24)
CHS	20.93 (2.12)	20.75 (3.25)	22.13 (2.85)	21.31 (3.28)
Males/Females	7/8	4/8	7/9	3/13

Note: standard deviation in parentheses

Appendix G

Analysis of baseline differences in CVR and mood measures: ANOVA

One-way ANOVA for baseline differences in blood pressure between the Stress and No-stress groups collapsed across Humor and Sex.

Source	MS Error	df	F	p
Group	1101.70	1, 57	6.41	.01

One-way ANOVA for baseline differences in blood pressure between the Humor and No-humor groups collapsed across Stress and Sex.

Source	MS Error	df	F	p
Group	44.58	1, 57	.23	.63

One-way ANOVA for baseline differences in blood pressure between males and females collapsed across Humor and Stress.

Source	MS Error	df	F	p
Group	2201.10	1, 57	14.42	.00

One-way ANOVA for baseline differences in HR between the Stress and No-stress groups collapsed across Humor and Sex.

Source	MS Error	df	F	p
Group	261.49	1, 57	1.51	.23

One-way ANOVA for baseline differences in HR between the Humor and No-humor groups collapsed across Stress and Sex.

Source	MS Error	df	F	p
Group	165.01	1, 57	.94	.34

One-way ANOVA for baseline differences in HR between males and females collapsed across Stress and Humor.

Source	MS Error	df	F	p
Group	1078.84	1, 57	6.77	.01

One-way ANOVA for baseline differences in POMS scores between the Stress and No-stress groups collapsed across Humor and Sex.

Source	MS Error	df	F	p
Group	93.66	1, 57	2.22	.14

One-way ANOVA for baseline differences in POMS scores between the Humor and No-humor groups collapsed across Stress and Sex.

Source	MS Error	df	F	p
Group	6.50	1,57	.15	.70

One-way ANOVA for baseline differences in POMS scores between males and females collapsed across Stress and Humor.

Source	MS Error	df	F	p
Group	.628	1, 57	.01	.91

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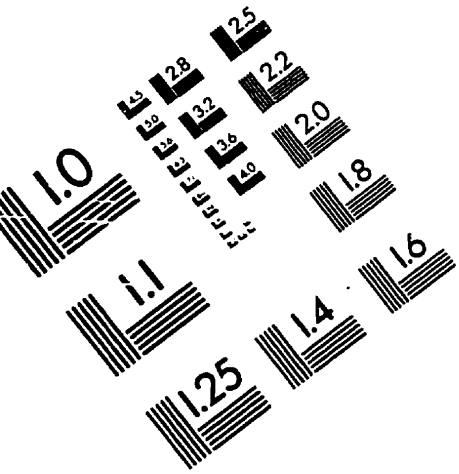
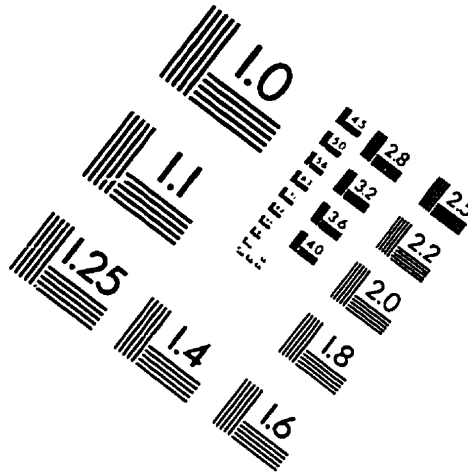
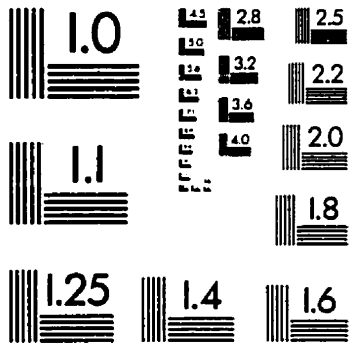
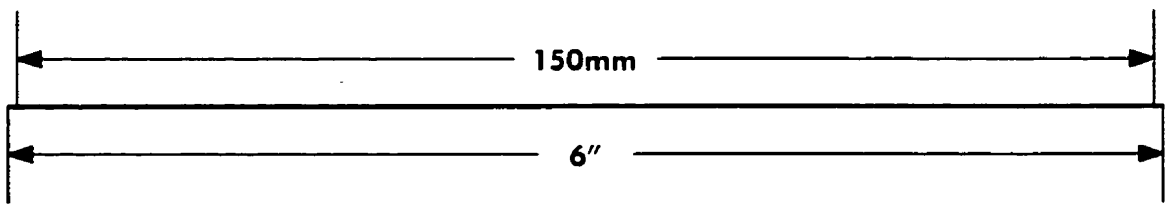
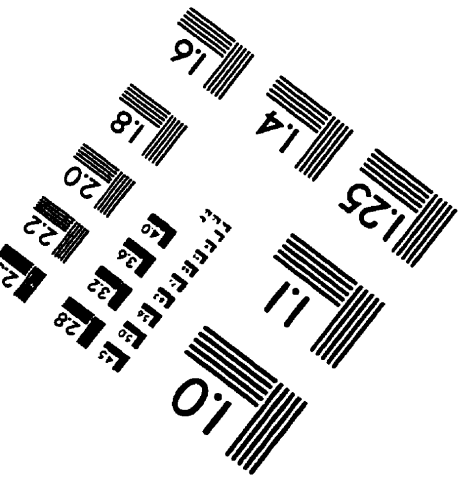
TEST TARGET (QA-3)

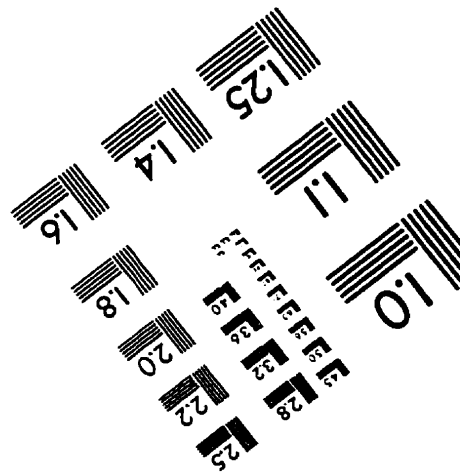












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