Humor Expression & Appreciation: The Impact of Musically Induced Arousal

A Departmental Honors Thesis

by

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PURPOSE OF THESIS:

The present study attempts to explore the influence of arousal in determining the association between humor expression and appreciation. Current literature accepts three possibilities in the explanation of this relationship. The facial feedback hypothesis suggests that facial expressions cause emotions. The common sense view states that the emotion leads to the facial expression. Lastly, the situation hypothesis places emphasis on the environment influencing the two variables independently. The current study suggests that all three of these hypotheses are refutable with evidence of arousal influence. This factor has been largely underestimated in examining the connection between emotion and expression.

The present study employed 53 subjects who were induced with one of three arousal states that was determined by music type if any they heard. Group PMA listened to positive arousal music that was predicted to cause higher levels of humor appreciation and longer durations of smiling and laughing to a comedy tape. The opposite was predicted for Group NMA that listened to negative arousal music. This group should have lower humor appreciation and shorter smile and laugh durations. Group NM that listened to no music was foreseen to lie somewhere in the middle of the former conditions.

The results indicated a significant relationship between arousal and facial expressions. Those listening to positive music displayed more facial expression than those in the no music and negative music conditions. No significant results were obtained from arousal and humor appreciation levels. With this evidence as support, three new models have been offered explaining the relationship between humor expression and appreciation.
Humor Expression & Appreciation: The Impact of Musically Induced Arousal

The influence of emotional expression is a widely explored topic in psychological literature. Much research has been conducted studying the effects of external stimuli in inducing arousal and its resulting mood state, such as relieving depression or influencing humor appreciation (Zuckerman, Klorman, Larrance, Spiegel, 1981, Laird, 1974, Lanzetta, Cartwright-Smith, Eleck, 1976, Deckers, Kulhorst, Freeland, 1987, McGhee, 1983). The present research tries to exhibit such a relationship between different types of music and the mood states that they may produce in terms of arousal level. The amount of arousal may be a truer indicator of humor appreciation than the actual playing of music itself (the external stimulus). Greater amounts of induced arousal are associated with increased enjoyment (McGhee, 1983). Arousal level may also be the most significant contributor to the facial expressions linked to specific emotions (Goldstein, 1970).

The music acts to arouse or not arouse, depending on type. Music that results in positive arousal or an enhanced mood state, should result in elevated levels of humor appreciation. This may appear as longer smile duration and higher amusement ratings to external cues such as comedy. The converse would be expected of music producing lower levels of arousal. Other research also conveys that increased physiological arousal may influence overt reactions of amusement (Goldstein, 1970, Godkewitsch, 1976, Langevin & Day, 1972, Chapman, 1973, 1978). However, some conflicts do exist in the attempt to indicate the connection between emotions and facial responses.
**Facial Feedback Hypothesis:**

The facial feedback hypothesis suggests that expressions elicit emotions (Mook, 1978). This hypothesis follows Darwin's notion that nonverbal displays regulate the experience of emotion. The facial feedback hypothesis is also in congruence with the James-Lange Theory that holds that muscular changes give rise to emotional experience (Zuckerman et al., 1981). This hypothesis would infer that if subjects were asked to assume a facial expression, the result would be the feeling of the emotion that directly relates to the facial expression. So if subjects were asked to smile, then the result should be higher levels of amusement or positive feelings. The facial feedback hypothesis can be seen in the following diagram:

![Facial Feedback Diagram](image)

**Situation Hypothesis:**

However, other possibilities do exist. One is that expressions may be a reaction to the situation that also produces the emotion (Mook, 1978). With this hypothesis, the stimulus acting upon the subject may produce the emotion and the facial response, but through separate channels.

![Situation Diagram](image)
The facial response and the emotion may correlate, but nothing is said about causality. Thus, emotions and facial responses are separate entities being influenced independently by situation, but not by each other. With this hypothesis, subjects would be influenced by an external stimulus such as comedy, but the comedy would elicit both the facial expression and the emotion (amusement) separately. This approach suggests there is no connection between emotion and facial expression and that the external stimulus is the contributing factor to both elements. There would be no causal relationship between the emotion and the facial response, only a correlation. Yet, there is still another likelihood that only emotions cause facial expressions.

**COMMON-SENSE HYPOTHESIS:**

This third possibility is known as the common-sense view, which holds that when we experience an emotion the result is a facial expression that represents the specific emotion (Mook, 1978). So highly amused subjects would display smiles or laughter, while depressed subjects would frown or exhibit negative facial features. This hypothesis infers that there is a cause-effect relationship between the two elements. The direct experience of an emotion will cause the appropriate facial response. The following diagram depicts the common-sense view:
The common-sense view suggests that the emotion triggers the facial response. When an emotion is experienced, the appropriate facial response should directly follow in sequence.

**AROUSAL AS A VARIABLE:**

A great amount of controversy surrounds the former three hypotheses in what has the greatest impact in influencing the tie between emotion and facial response (Tourangeau & Ellsworth, 1979, Zuckerman et al., 1981). One element the three views fail to emphasize within their boundaries is the influence of arousal. Arousal may cause physiological changes in the body that may be the contributing factor to the experience of emotion and facial expression (Chapman, 1973, 1979, Godkewitsch, 1976, Langevin & Day, 1972, Goldstein, 1970, Stratton, & Zalanowski, 1989). This may elevate or decrease emotion and response according to type of arousal instilled.

If subjects receive an arousal boost, levels of emotion and expression should also increase (Wilson, 1979). Those who are subject to no arousal boost would experience lower levels of expression and emotion.
Numerous studies have attempted to show the relationship between arousal and humor appreciation (Wilson, 1979, Berlyne, 1960). Additionally, much research has been conducted on the link between arousal and emotion (Goldstein, 1970, Godkewitsch, 1976, Langevin & Day, 1972) and also with arousal and expression (Deckers et al., 1987, Tourangeau & Ellsworth, 1979, Zuckerman et al., 1981). The following text describes the findings of several studies that show the impact of arousal on humor appreciation.

**THE SIGNIFICANCE OF AROUSAL:**

Findings by numerous studies have shown the relationship between physiological effects of the body (arousal) and humor appreciation. Wilson (1979) proposes that this connection is linked to the amount of arousal boost. The more aroused subjects are the greater the amount of humor appreciation will appear. Another possibility is that arousal and humor appreciation have an inverted-U connection. This idea suggests that arousal can only be increased to a certain extent. Extreme levels of arousal may in turn inhibit the arousal process and decrease overall effects (Berlyne, 1960). More research has supported Wilson’s view of arousal boost than Berlyne’s, that suggest that the relationship is similar to an inverted-U (McGhee, 1983, Godkewitsch, 1976, Langevin & Day, 1972, Chapman 1973, 1978, Goldstein, 1970).

In two such studies by Godkewitsch (1976) and Langevin and Day (1972), results concluded that there exists a positive linear relationship between a subject’s heart rate and funniness ratings to cartoons. The higher the subject’s heart rate at the time a cartoon was presented, the funnier it was rated. Godkewitsch (1976) also found a positive
relationship between self-reports of arousal and funniness ratings. So when subject’s reported higher feelings of arousal, they also perceived the cartoons as funnier. Another variable that was also consistent with increased heart rate was the subject’s GSR (Galvanic Skin Response). A positive relationship appeared between funniness ratings and the subject’s GSR (Godkewitsch, 1976, Langevin & Day, 1972). So as funniness ratings increased, GSR levels rose as well. This latter finding plays an important role in the connection between the inducers of arousal that will be described later.

A relationship has also been drawn between muscle tension and funniness ratings. Chapman (1973, 1978) found that subjects who gave high ratings of funniness to jokes had significantly greater amounts of muscle tension 30, 40, and 50 seconds into joke duration. This further supports the notion that higher levels of physiological arousal are connected with funniness ratings.

Additionally, a study by Goldstein (1970) found a relationship between arousal and humor appreciation. Goldstein found that males who were sexually aroused prior to seeing cartoons, displayed higher levels of humor appreciation to subsequent cartoons. Their initial ratings of humor were no higher than the control, but over time their ratings stayed consistent, whereas the control group’s ratings dropped significantly (Goldstein, 1970).

The research cited suggests a definite connection between arousal levels and humor appreciation. In the findings of all the previous research listed, arousal level increased along with humor appreciation. There does exist other possibilities in producing a state of arousal. Music is one variable that has been shown to have an effect
on the amount of arousal a subject may experience (McFarland, 1985, Stratton & Zalanowski, 1989, preliminary research).

THE CONNECTION BETWEEN AROUSAL, MUSIC, & EMOTION:

Another effective means of prompting arousal and an emotional state is through the use of music. Music has been shown to be a direct predecessor to physiological arousal. In a study by McFarland (1985), a direct relationship was shown between music type and skin temperature. Music determined to produce negative emotions terminated temperature increases and influenced temperature decreases. On the converse side, music judged to produce positive emotions resulted in increased skin temperature. This shows that the type of music induced can have a significant impact on the body (McFarland, 1985). It has been shown previously that increased GSR levels correlates with higher levels of humor appreciation. It has also been established that research indicates a relationship between music and skin response. With the latter predications, it would seem that the influence of music would have an effect on emotional experience.

This can be seen in the findings of Stratton and Zalanowski (1989), which revealed a connection between neutral music and changing depressive states. In their experiment, subjects who were initially depressed were brought out of this state by neutral music. Pleasant and sad music did not have significant effects, but it was clear that the neutral music did relieve subjects of depressive moods, a process of changing arousal from the negative to the positive (Stratton & Zalanowski, 1989).
Finally, preliminary research conducted before the present study showed a direct relationship between type of music and facial response. Subjects were asked to listen to one of three conditions of music (neutral, sad, or happy). After listening to the music, they were asked to listen to three segments of comedy while their facial expressions to the comedy tape were being recorded. The results showed that the neutral music had the most significant effect in causing facial expression to the comedy tape. However, the neutral music and other music conditions had no effect on amusement ratings. What was not known was why the neutral music had the greatest impact on determining facial response or why the different music conditions had no effect on amusement ratings.

Many other variables could influence the effect of facial expression and emotional experience. Other variables could include the time of day or even weather. Some subjects might respond differently to the music and comedy at distinct times of the day. Further, some subjects may react according to weather patterns. Sunny and warm days may influence subjects in a more positive fashion than days that are cold or stormy. Another possibility is that arousal level may be the most significant indicator in the experience of emotion and expression. With previous research as support, this is what the present study tries to exemplify.

**The Present Hypothesis:**

The present research tries to formulate a concept that arousal level (boost or no boost) is the most important factor in determining the amount of emotional experience or facial responsiveness will occur in a situation. Since it has been shown that arousal can
have an effect on humor appreciation (Wilson, 1979, Godkewitsch, 1976, Langevin & Day, 1972, Goldstein, 1970) and that music can influence arousal levels (Stratton & Zalanowski, 1989, preliminary research), then subjects who receive an arousal boost by music should show greater humor responses than non-aroused subjects. Highly aroused subjects should show greater facial expression and amusement ratings compared to low aroused subjects. It was predicted that if an intervening state of arousal was produced by music before subjects listened to a comedy tape, then the subjects would respond expressively and emotionally, according to the arousal induced. This follows Wilson’s (1979) notion that arousal boost will lead to greater amounts of humor appreciation. This hypothesis rejects the models that suggest that expressions cause emotions or that emotions trigger facial response (facial-feedback & common sense views). It also does not confide in the situation hypothesis that states the environment is the antecedent to expression and emotion.

The differentiation between levels of arousal was shaped by two types of music. The music that produces positive arousal (arousal boost) was predicted to demonstrate higher levels of facial reaction in the form of smiling and laughing to a comedy tape. These subjects should also display higher levels of humor appreciation as a subjective experience in ratings of the comedy tape. The opposite is true for subjects inflicted with a negative arousal mood state (no arousal boost). They would display the lowest levels of facial expression. They should also rate the comedy tape less amusing than subjects positively aroused. Subjects in the control condition should lie somewhere between the two music conditions in facial response and emotional experience.
METHOD

SUBJECTS:

Subjects were 53 undergraduate general psychology students from Ball State University. All subjects received credit towards a course requirement to participate in experimental study. Subjects read and signed an informed consent form prior to and directly following the experiment. The consent form at the end of the experiment granted the experimenter permission to view the video tape and record facial reactions, which had been done without the subject’s awareness.

DESIGN:

Subjects facial reactions to comedy tape were measured after they had been exposed to one of three music conditions. The experiment employed three independent groups of subjects, which differed on the type of music, if any they heard. Group (NM) heard no music. Group (PMA) heard positive arousal music and group (NMA) heard negative arousal music. Music manipulation was followed by presentation of a comedy tape. These conditions (groups) were employed with the intent of influencing a positive or negative arousal state (arousal boost or no arousal boost). Subjects filled out the PANAS to determine if a state of arousal was induced by the music.

MATERIALS:

One of two conditions of music or no music was used to influence arousal. The music was rated as either positive (modern dance music) or negative (contemporary...
classical). The positive music was increased in tempo by two percent. The negative music was also increased in tempo from the LP setting of 33 RPM, to the 45 RPM level. A preliminary study provided ratings of arousal for the two different types of music. The positive music induced excited feelings among subjects (Group PMA), while the negative music was rated as annoying, producing negative arousal (Group NMA). The only difference between music was the subjective ratings of emotion. Everything else such as tempo and volume were held constant between conditions. Subjects in the condition without music (Group NM) waited in silence.

The PANAS affect scale developed by Watson, Clark, and Tellegen (1988), was used to measure subject’s degree of positive and negative affect. This scale was developed with the intent to discriminate between subjects experiencing positive versus negative affect levels. It was chosen for this experiment due to the need of measuring subject’s arousal type and intensity. All subjects were exposed to a 6 minute comedy tape by Jeff Foxworthy, which was used to evoke facial expressions and feelings of humor. A video camera was used to record subject’s facial expressions behind a two-way mirror without the subject’s awareness.

The experimenter explained the procedures, managed the audio tapes, and operated the video equipment. A five-point scale was used to classify subject’s facial reactions, (0 = no reaction, 1 = faint smile, 2 = smile, but no teeth showing, 3 = smile, with teeth showing, 4 = chuckle or small exhalation of air, 5 = laughter). Subjects also filled out a questionnaire with the following inquiries: (amusement rating, music tempo rating, music rating, and subjective rating of feeling).
The amusement rating scale ranged from 0 - 9 and was the sole measurement utilized to judge subject’s emotions (feeling) to the comedy. A score of 0 implies that the subject is not amused and a score of 9 means that the subject is highly amused. The tempo rating scale ranged from 0 - 9. Lower scores would indicate an extremely slow tempo, whereas higher scores indicate very fast tempo. The music rating question asked subjects if they thought the music was too fast, too slow, or normal in tempo. This was used to indicate subject’s feelings towards the music tempo. The music rating question provided the subjects with the opportunity to express whether the music sounded appropriate in regards to tempo.

The subjects were additionally asked to convey their feelings towards the music. This scale ranged from; excited, no effect, bored, and other, which the subject could explain feelings that were distinct from the former choices. Feelings to the music were recorded to view subject’s over all reaction to the type of music played. This allowed the experimenter to observe subject’s reactions to the music to see if the music type was adequate for the desired effect (arousal boost or no arousal boost).

PROCEDURES:

Subjects were first given a general description of the experiment via an informed consent form. After the introduction, subjects were randomly assigned to one of two conditions of music (Groups PMA and NMA) or no music (Group NM). Once the subjects had listened to 5 minutes of music, they were asked to fill out the PANAS. The subjects that were exposed to music initially, continued to listen to music until they
completed the PANAS. Those formerly subjected to no music, finished the scale in silence. Each condition lasted for 10 minutes before the next segment of the experiment began.

Directly following music or no music inducement, subjects listened to the comedy tape for 6 minutes. When the comedy tape began, the experimenter went to the adjacent room and started the video camera to record facial expressions. Once the comedy tape was over, the subjects were asked to fill out a brief questionnaire regarding the music and comedy segment (amusement, tempo, music, and feeling ratings). When finished, all subjects were debriefed about the purpose of the experiment. After the conclusion of the experiment, the experimenter viewed the video tape and scored all facial responses. This was done without knowledge of what type of music the subjects were exposed to, so biasing toward conditions could be avoided.

RESULTS

To Determine if Music Influenced Affect:

The data does support the prediction that music type can influence a positive arousal level. This was determined by scores on the PANAS. Higher PA scores, indicates higher levels of positive arousal, whereas higher NA scores indicate higher levels of negative arousal. The results indicate that the positive music condition yielded
the highest PA score ($M = 29.52$), while the negative music condition ($M = 22.05$) and those that listened to no music ($M = 28.50$) were significantly lower ($F(2) = 5.01, p < .01$, $MS = 291.25$). However, the results did not produce significant findings for NA scores (positive music, $M = 16.47$, negative music, $M = 15.00$, no music, $M = 13.94$, $F(2) = 1.17, p < .317$, $MS = 28.07$). These results can be seen in Figure 1.

The graph clearly exhibits the relationship between music type and the amount of positive or negative arousal produced. Subjects listening to the modern dance music (PMA) gained slightly higher levels of positive affect (PA) than subjects in the no-music condition (NM). Subjects listening to modern dance music and those with no music had much higher positive affect than those who were in the classical contemporary condition (NMA). Those who listened to positive music (Group PMA) displayed the highest NA scores, where as those listening to negative music (Group NMA) and no-music (Group NM) had lower scores. Differences in NA scores were not significant across the various conditions, $F(2), = 1.17, p < .317$. 

![Figure 1 Mean affect expressed as a function of music conditions.](image-url)
AROUSAL INFLUENCE ON FACIAL EXPRESSION:

The data supported the prediction that facial expressions to the comedy tape would be influenced by the different arousal conditions. Subjects exposed to the positive music displayed higher facial expression \((M = 4.17)\) than the negative music condition \((M = 3.05)\) and the no music condition \((M = 4.05)\), \((F(2) = 3.89, p < .026, MS = 6.72)\).

**Figure 2** shows how subjects exposed to positive arousal music (PMA) expressed higher levels of facial response than both the no-music condition (NM) and the negative arousal condition (NMA). Group PMA had a mean of 4.17 which on the face scale equals a chuckle or single exhalation of air. This is higher than the NM group that still averaged a chuckle and the NMA group that had a mean of 3.05, a smile with teeth showing.

The results indicated that arousal condition also affected the duration of facial expression in the amount of seconds the response occurred (see **Figure 3**). Those who listened to positive music smiled longer \((M = 121.64)\) than both negative music \((M = 70.00)\) and no music conditions \((M = 117.05)\), \((F(2) = 6.46, p < .003, MS = 14529.15)\).
The results were not significant for laugh duration in seconds (positive music, $M = 19.82$, negative music, $M = 13.44$, no music, $M = 18.66$, $F(2) = .357$, $p < .70$, $MS = 204.69$). Subjects who were exposed to the positive music condition (PMA) smiled longer in the amount of seconds than the no-music group (NM) and the negative music group (NMA).

The results were significant for the type of arousal condition and the amount of time subjects did not respond facially to the comedy tape. Subjects who listened to positive music had the shortest duration of facial no-response in seconds ($M = 239.70$), where as the negative music group had the highest amount of no-response ($M = 296.55$).
and the no music condition appeared between the two \( (M = 242.05), (F(2) = 4.91, p < .011, MS = 18424.59) \). The results become more apparent in Figure 4. The graph shows how subjects who listened to positive music (Group PMA), spent longer duration in smiling and laughing than those listening to negative music (Group NMA) and the no-music condition (Group NM).

**INFLUENCE OF AROUSAL ON AMUSEMENT RATINGS:**

The condition type had no influence on amusement ratings to the comedy tape (positive music, \( M = 6.76 \), negative music, \( M = 7.05 \), no music, \( M = 7.44 \), \( F(2) = .976, p < .383, MS = 2.04 \)). In Figure 5 the results can be seen as non-significant. There was no difference between conditions (PMA, NMA, NM) in ratings of amusement to the comedy tape. Group NM (no-music) gave the highest ratings to the comedy tape, while Group NMA (negative music) and Group PMA (positive music) had lower ratings, although the results were not significant, \( F(2) = .976, p < .383 \).

![Figure 5](image)
**CORRELATIONAL SUPPORT:**

With these results it would be expected that there would be a strong correlation between amusement ratings and response duration (no-response, smiling, laughing, see Table 1). This was apparent with the correlational data. Amusement ratings increased along with longer durations of smiling and laughter, while decreasing with longer durations of no-response time.

<table>
<thead>
<tr>
<th>Table 1. (N = 5) Supporting Correlational Evidence for the Present Hypothesis.</th>
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<td><strong>SMILE</strong></td>
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Significant correlations would also be foreseen between the amount of laughter, smile duration, and no-response time and the amount of arousal on the PANAS (see Table 1). This also occurred. As the PA score rose so did the amount of laugh and smile duration to the comedy tape. The opposite is true for no-response time. As the PA score
increased, levels of no-response decreased. There was no correlation between PA score
and amusement ratings. Additionally, no significant correlations existed between NA
scores and amusement ratings or response duration. PA and NA scores did not correlate
since these are two independent dimensions (Deckers et al., 1987).

There were additional correlations between face scores, PA level, response
duration, and amusement ratings. As the face score increased so did PA scores, smile
duration, laugh duration, and amusement rating. Face scores decreased when no-response
time increased, (See Table 1)

**DISCUSSION**

**EVIDENCE OF AROUSAL INFLUENCE:**

After viewing the results it becomes evident that arousal did influence a subject’s
facial response to the comedy tape in terms of overall expressiveness and duration. It was
also established that the music condition did distribute differently between arousal levels
(arousal boost or no arousal boost). Arousal influence was verified by the PANAS,
which showed that subject’s listening to positive music (Group PMA) did experience an
arousal boost as compared to the negative music (Group NMA) that resulted in a decrease
or no change in arousal levels. These findings further support the notion that arousal does
have an impact on humor expression. When arousal levels are increased, it is normal for
the body to react accordingly with physical changes (McGhee, 1983). This may range from increased heart rate to higher muscle tension (Godkewitsch, 1976, Chapman, 1973, 1978). The findings support Wilson’s (1979) standpoint that when arousal levels increase (arousal boost), so does the amount of humor appreciation. Subjects who received an arousal boost displayed higher levels of facial expression to the comedy tape in facial intensity and duration of response.

The music manipulation affected arousal and facial reactions but not amusement ratings. No differences were found between subjects receiving an arousal boost or no arousal boost and their amusement ratings to the comedy tape. Subjects induced with arousal boost rated the comedy just as amusing as those in the no arousal boost and control conditions. The reason the results for this portion of the experiment were not significant is not known. Other research however, has shown a correlational relationship between arousal and amusement (Goldstein, 1970, Godkewitsch, 1976, Langevin & Day, 1972, Chapman, 1973, 1978). The cause-effect relationship between the two elements may exist, but the present experiment may have not used a technique sensitive enough to measure this aspect.

AROUSAL & AMUSEMENT: CORRELATIONAL SIGNIFICANCE

There still remains the probability that a cause-effect relationship exists between arousal and amusement. There has been strong support indicating a positive linear relationship between the two aspects. This is what the present study concluded and others have found the same results (Godkewitsch, 1976, Langevin & Day, 1972), but
there is the possibility that the current study needed to be more sensitive to observe this aspect. The arousal variations between conditions, may not have been large enough to produce differences in amusement ratings.

With the results of the present research, it appears that arousal does have an impact on the facial response to stimuli such as comedy. Since both are physical functions of the body and with the previously established connections between the two components (Stratton & Zalanowski, 1989, and preliminary research), it seems appropriate that this portion of the study obtained significant results. The relationship between arousal and the emotional experience of amusement may be more difficult to establish, since one element is of the mind and the other is a bodily function. Since the results only hinted a correlational link between the two, it is not known from the present study if one causes the other element. The association is apparent since other research has indicated that arousal is related to humor appreciation (Goldstein, 1970, Godkewitsch, 1976, Langevin & Day, 1972, Chapman, 1973, 1978).

THE LINK BETWEEN AMUSEMENT AND FACE EXPRESSION:

After initially reviewing the three possible models for the connection between emotion and expression (facial-feedback, situation, common sense), none are applicable with the findings of the current study. The facial-feedback hypothesis which suggests that facial expressions cause emotions was refuted by this study, along with the common sense view that states emotions cause facial responses. Additionally, the situation hypothesis is also rejected that states the environment causes emotions and expressions
(Mook, 1978). The present study institutes arousal as a direct precursor to the facial responsiveness to comedy stimuli. Although results were not significant for the arousal condition and amusement ratings, enough evidence appears among other variables to refute the last mentioned models. There still remains the possibility that the arousal differences were not large enough between the three conditions, which may have resulted in non-significant findings in amusement ratings.

The present study indicates that the relationship between emotion and expression is merely correlational. Strong positive correlations existed between amusement ratings and facial expressiveness. This included no-response, smile, and laugh durations, and the overall amount of expression (see Table 1). All of the variables correlated at a significant level, but only the arousal condition could be interpreted as causing facial responses. No direct relationship was found between arousal condition and amusement ratings. Further, previous findings by Deckers et al. (1987) displayed similar results.

A study by Deckers et al. (1987), found a positive correlation between facial reactions and funniness ratings. So as spontaneous facial reactions increased, so did funniness ratings to cartoons. The subjective experience did not seem to be affected by voluntary changes in the amount of facial response. Subjects who were voluntarily facially more reactive to the cartoons did not rate them as funnier than subjects who voluntarily showed less facial response. These results suggest that the relationship between facial expression and emotion is only correlational because voluntary facial response changes did not result in amusement rating change (Deckers et al., 1987). This further implies that the bond between emotion and face response is only a correlation.
CONCLUSION: THE RELATIONSHIP BETWEEN AROUSAL, EXPRESSION, & EMOTION.

The amount of arousal may be a truer indicator of how much facial expression or emotion will occur. Arousal may contribute to emotion and response in three different ways. Arousal may act only on facial expression and not emotion. Other possibilities are that arousal influences emotion but not facial expression or arousal may affect expression and emotion independently. More detail is given to the three likelihoods.

First, arousal may act as a direct predecessor to the expression of emotion. Once the connection has been established between arousal and the expression, the appropriate emotion may follow. After arousal is instilled, the subsequent course of action would be comparable to the facial-feedback hypothesis. However, this view is unique from the latter in that the arousal is the initial antecedent to the actual experience of emotion, not facial expression. This can be further discerned in the diagram below:

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AROUSAL
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     EMOTION
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Once the expression is induced by arousal, the expression would lead to the appropriate emotion. So if subjects received an arousal boost along with an additional stimuli to create a facial expression, the facial expression would then lead to the corresponding emotion. This possibility is supported by the current research and remains a valid prospect. There were significant results between arousal condition and facial
expression. The positive music condition (PMA) displayed the highest levels of facial expression, while the negative music condition (NMA) and the no-music condition (NM) were significantly lower. Findings were not significant for amusement ratings and arousal, but other research sustains this relationship (Goldstein, 1970, Chapman, 1973, 1978, Godkewitsch, 1976, Langevin & Day, 1972). The present study also clearly established a positive linear relationship between amusement and facial expression. When amusement ratings rose, so did the subjects' facial responses. All data from current and previous research support this view.

Another possibility is that arousal may cause the emotion, which then leads to facial response. The link between arousal and emotion (amusement) was not supported by the present research, but since there has been correlational evidence established between bodily response and amusement, it still remains a possibility (Chapman, 1973, 1978, Goldstein, 1970, Godkewitsch, 1976, Langevin & Day, 1972). The current research may not have been sensitive enough to measure this aspect. This would be similar to the common sense view, which states that emotions cause facial expression (Mook, 1978).
It is different due to the element of arousal influencing facial response and not the emotion alone. The diagram on the previous page shows how arousal may influence this particular relationship. This example suggests that arousal causes the emotion which produces the facial expression. If subjects were aroused along with another stimuli to produce emotion, then the fitting facial response would ensue. This was not apparent in the present research. No differences appeared in amusement ratings between the positive music condition (PMA), negative music condition (NMA), and no-music condition (NM). Subjects did not display significant differences in amusement ratings by the type of arousal induced, but a correlation between amusement and facial expression was determined. One final avenue must be explored that indicates arousal influence through separate channels.

The last probability is that arousal may interact with emotions and expressions independently. This somewhat resembles the situation hypothesis that suggests the situation acts independently to influence expression and emotion (Mook, 1978). Contrary to the situation hypothesis, arousal would be the precursory element in the influence of expression and emotion. In this case, arousal may act independently, through separate channels in influencing expression and emotion. The relationship between emotion and expression would only be correlational.
The present research does indicate a causal relationship between arousal and expression, but not between arousal and emotion. Subjects listening to positive music (PMA) were most expressive, while those listening to negative music (NMA) and no-music (NM) displayed less facial response. No significant findings were substantiated between the latter variable conditions and amusement ratings to the comedy tape. However, since prior research does suggest a positive linear relationship between arousal and emotion (Goldstein, 1970, Godkewitsch, 1976, Chapman, 1973, 1978), it may be the most valid hypothesis of the three mentioned. The current study supports this model due to the positive correlations found between amusement and expression and the causal relationship established between arousal and facial expression.

The relationship between arousal and expression may be easier to view since both are bodily functions. This has been widely established by previous researchers (Chapman, 1973, 1978, Goldstein, 1970, Godkewitsch, 1976, Langevin & Day, 1972). The connection between arousal and amusement may be more sensitive and more difficult to establish. So this hypothesis may still hold validity. The present study might not have been adequate to measure this aspect of the relationship to determine causality. Other research could be conducted to further establish this possibility.

The present research established a causal relationship between arousal and facial expression to comedy stimuli. The findings were verified with the use of the PANAS that determined arousal levels of the various conditions. Arousal boost was shown to have an effect on subjects’ experience of humor, which supports Wilson’s hypothesis (1979). Additionally, a positive linear relationship was shown between amusement and
facial response. This further supports other research in the same context (Deckers et al., 1987, McGhee, 1983). No significant findings were determined between arousal and amusement ratings, but this element of the experiment may require a more sensitive method of observation. Previous research in this area has supported this association with correlational evidence (Godkewitsch, 1976, Langevin & Day, 1972, Chapman, 1973, 1979, Goldstein, 1970).

All findings are not in concordance with the three previously stated models that suggest the connection between emotion and face expression. The current study indicates that arousal has a vast impact on at least one of the two variables and other research suggests the same. Three new models have been proposed indicating the affect of arousal, with one gaining full support from the present study. Additional research will be required to further exemplify the significance of arousal's influence on facial expression and emotional experience.
REFERENCES


