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# DIFFERENTIAL EFFECTS OF STIMULATIVE AND SEDATIVE MUSIC ON ANXIETY, CONCENTRATION, AND PERFORMANCE[1]

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*Summary.*—30 music majors and 30 psychology majors were tested individually under stimulative, sedative, and no-music conditions. Each subject was exposed to one of five types of music: classical, jazz and blues, country/bluegrass, easy listening, and rock/rock and roll. Under each condition subjects indicated their (a) worry about the test, (b) emotionality or physiological-affective arousal, (c) ability to concentrate, (d) expectancy of performance, and (e) like or dislike of the music. Compared with sedative music stimulative music increased worry scores, interfered with concentration, and resulted in lower expectancies as predicted. Thus the effects of music are to be understood in terms of cognitive processes rather than primarily on the basis of physiological-affective responses to musical stimuli. A complex interactive effect on task performance was reported.

This study concerned the effects of music on anxiety and intellectual performance. It has long been recognized that music affects the emotional state of the listener and current research is clarifying the complexities involved in that relationship. Several researchers have shown (Smith & Morris, 1976) that happy, exciting and stimulative music produces higher levels of state anxiety, physiological arousal, and aggression as compared with sad, calm, and sedative music. Similarly, Peretti (1975) found that classical music played during performance of a laboratory task reduced anxiety (assessed by GSR), especially for music majors and for females.

The effect of music on performance is complex, involving both type of music and person variables. While Mowsesian and Heyer (1973) found performance on standardized tests and self-rating on a self-concept measure to be unaffected by rock, folk, classical instrumental, or classical vocal music, other studies have reported positive effects of soothing, background, and classical music on performance. Kaltsounis (1973) found scores on a simple creativity task to be better during music than during industrial sound. Mezzano and Prueter (1974) reported that soothing music promoted more interaction in counseling interviews than stimulative or no music.

Stanton (1973), using classical music during a test situation, found a significant interaction between the presence or absence of music and level of test anxiety for university students. Highly anxious students achieved superior per-

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formance when exposed to background music. In a second experiment, both secondary and university students with high test anxiety received higher scores on a standardized task with as opposed to without music. In contrast Williams (1961) discovered that popular music more than classical music adversely affected quantitative task performance of students of average and above academic rank, and boys' performance more than that of girls. Fogelson (1972) found that both bright and nonbright students performed better on a standardized test without music, with popular music being a greater distraction to the nonbright group.

The present study is the second in a series aimed at elucidating the complex effects of music on anxiety and performance, taking into account as many as possible of the variables mentioned above: music variables, person variables, task variables, and anxiety components. The initial study (Smith & Morris, 1976) used an academic-test situation and five types of both stimulative and sedative music, selected according to Gaston's (1951) definitions. Stimulative music increased anxiety while sedative music had no effect relative to that of the control group. Test performance was not affected. In the present study an intelligence-test situation was utilized, and the additional variable of the subject's interest and involvement in music was included. Other differences in design were aimed at making this study as fully complementary to the initial study as possible.

On the basis of previous findings and theoretical considerations, it was hypothesized that both worry and emotionality scores (components of the anxiety experience) would be higher, and performance poorer, under stimulative music than under sedative or no music. The rationale is that stimulative music produces more physiological arousal (emotionality) and is more distracting (which hurts performance and increases concern or worry about performance) than sedative music.

## METHOD

Thirty music majors and 30 psychology majors (both male and female) voluntarily participated and were assigned randomly to five types-of-music groups: classical, country/bluegrass, jazz and blues, easy listening, and rock/rock and roll. The experimental task was divided into five periods, beginning with the administration of the Digits Backward test according to standard procedures (Wechsler, 1955, p. 41). The level at which the subject failed twice was considered his limit and all further series were at the level of one digit less than his limit. Students whose limit was four digits were given four digits instead of three. After the limit was determined, the subjects were given six series of digits to further acquaint them with the task. In the next three periods the same series of digits given during the acquaintance period under the conditions of stimulating music, none, and sedative music were presented. Each of

the six possible orders of the three conditions was assigned to one of the six subjects in each group.

Immediately after each period subjects indicated their concentration, worry, emotionality, and expectancy in response to the following questions. All questions except expectancy were scored on a scale of 1 to 5. For concentration, subjects were instructed to "Rate your ability to concentrate during this section." The worry and emotionality questions, stated respectively as follows, represented a brief form of the 10-item worry-emotionality scale used in previous research (Liebert & Morris, 1967). "To what extent do you lack confidence or feel insecure, regretful, or fearful about your performance?" and, "To what extent do you feel nervous, tense, panicky, uneasy, upset or jittery?" In addition groups given stimulative and sedative music answered questions concerning their like or dislike of the music played during that section. For expectancy the subjects indicated the probability (ranging from 0 to 1.0) that "You will do as well on this test as you would like." The performance measure was the number of correct series of digits repeated backwards under each condition. Data for all dependent variables were subjected to three-way analyses of variance (majors $\times$ music groups $\times$ music conditions).

In addition scores of the psychology majors on a 34-item "musicality" scale (Good & Parker, 1976) were correlated with all dependent variables. The scale was designed to assess the extent to which one enjoys and participates in musical activities and evaluates himself as being knowledgeable and capable in music.

## RESULTS

The major emphasis in this study as reflected in the hypothesis concerns the effects of stimulative music on worry, emotionality, and performance. Mean scores for these variables are presented in Table 1. For both worry and emotionality, there were significant main effects for music conditions (C) only ($F_{3,150} = 8.40$, and 3.66, respectively, $p < .05$). In both cases scores were higher during the acquaintance period than under music conditions, an effect of both time and experience. As expected stimulative music produced significantly more worry than sedative music ($t_{59} = 2.13$, $p < .05$), but neither mean differed significantly from no music. Though the trend was similar for emotionality scores, the difference between stimulative and sedative means was not significant.

For expectancy there were significant effects of music conditions and music conditions $\times$ majors ($F_{3,150} = 14.55$ and 4.64, respectively, $p < .05$). Consistent with the findings for worry, expectancy was lower during the acquaintance period than under music conditions and lower for stimulative than for sedative music, but for music majors only. Music and psychology majors differed significantly only for the sedative and no-music conditions.

For the like/dislike question, there were two significant main effects—majors and music conditions ($F_{1,50} = 5.41$ and 5.18, respectively, $p < .05$).

TABLE 1

MEANS AND STANDARD DEVIATIONS FOR EACH MEASURE

| Conditions | Acquaintance | | No Music | | Sedative | | Stimulative | |
|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| | | | Psychology Majors | | | | | |
| Concentration | | | | | | | | |
| Easy Listening | 3.00 | 1.26 | 2.67 | 1.51 | 4.00 | 1.10 | 3.33 | 1.51 |
| Rock & Roll | 3.67 | 1.03 | 5.00 | 0.00 | 2.00 | 1.10 | 2.33 | 1.63 |
| Jazz & Blues | 3.00 | 1.26 | 3.67 | 1.03 | 2.67 | 1.51 | 2.33 | 2.07 |
| Country/Bluegrass | 3.00 | 1.79 | 4.00 | 1.10 | 2.67 | 1.51 | 2.33 | 1.63 |
| Classical | 3.33 | 1.51 | 4.33 | 1.03 | 3.33 | 1.51 | 3.33 | 1.97 |
| Performance | | | | | | | | |
| Easy Listening | 2.67 | 1.21 | 3.17 | 1.72 | 4.67 | 0.82 | 3.50 | 2.17 |
| Rock & Roll | 4.33 | 1.51 | 4.33 | 1.63 | 3.33 | 1.37 | 4.17 | 2.23 |
| Jazz & Blues | 4.00 | 1.26 | 4.00 | 2.10 | 4.00 | 1.67 | 4.33 | 2.25 |
| Country/Bluegrass | 3.17 | 2.23 | 4.67 | 1.75 | 3.83 | 2.40 | 4.17 | 2.48 |
| Classical | 3.17 | 1.72 | 3.83 | 2.04 | 4.00 | 1.67 | 4.17 | 2.23 |
| Expectancy | 0.53 | 0.20 | 0.57 | 0.20 | 0.57 | .23 | 0.58 | 0.23 |
| Emotionality | 2.43 | 0.97 | 2.07 | 1.01 | 2.30 | .88 | 2.27 | 0.83 |
| Worry | 2.60 | 0.86 | 2.23 | 1.01 | 2.07 | .98 | 2.47 | 1.01 |
| Like—Dislike | | | | | 3.67 | 1.66 | 3.53 | 1.78 |
| | | | Music Majors | | | | | |
| Concentration | | | | | | | | |
| Easy Listening | 3.33 | 1.51 | 4.67 | 0.82 | 3.67 | 1.03 | 2.33 | 1.63 |
| Rock & Roll | 3.00 | 1.26 | 4.00 | 1.10 | 4.33 | 1.63 | 2.67 | 1.97 |
| Jazz & Blues | 4.33 | 1.03 | 4.33 | 1.03 | 3.00 | 1.79 | 3.67 | 2.07 |
| Country/Bluegrass | 1.67 | 1.03 | 4.00 | 1.67 | 4.67 | 0.82 | 3.67 | 1.63 |
| Classical | 3.33 | 0.82 | 4.67 | 0.82 | 3.33 | 0.82 | 3.33 | 1.51 |
| Performance | | | | | | | | |
| Easy Listening | 2.83 | 2.56 | 4.67 | 1.21 | 3.33 | 2.16 | 4.00 | 1.26 |
| Rock & Roll | 3.83 | 1.83 | 5.50 | 0.84 | 4.67 | 0.82 | 3.67 | 1.63 |
| Jazz & Blues | 4.17 | 0.75 | 4.50 | 1.52 | 5.33 | 0.82 | 4.17 | 2.14 |
| Country/Bluegrass | 3.33 | 2.16 | 4.67 | 1.21 | 5.50 | 0.84 | 4.50 | 1.38 |
| Classical | 4.83 | 1.60 | 6.00 | 0.00 | 5.83 | 0.41 | 6.00 | 0.00 |
| Expectancy | 0.54 | 0.20 | 0.68 | 0.19 | 0.71 | 0.21 | 0.66 | 0.21 |
| Emotionality | 2.20 | 1.00 | 1.87 | 1.04 | 1.73 | 1.05 | 2.00 | 1.20 |
| Worry | 2.83 | 0.99 | 2.37 | 1.03 | 2.17 | 1.09 | 2.30 | 1.18 |
| Like—Dislike | | | | | 4.80 | 0.61 | 3.93 | 1.72 |

Music majors liked all types of music better than psychology majors and all subjects liked sedative music better than stimulative. Product-moment correlations were computed between this and the other dependent variables for all subjects combined (see Table 2). For both stimulative and sedative music, like/dislike scores correlated positively with performance, concentration, and expectancy and negatively with worry and emotionality. Interestingly scores on the "musicality"

TABLE 2

PEARSON PRODUCT-MOMENT CORRELATIONS

| Measure | Psychology majors ($N = 30$) | | All subjects ($N = 60$) |
|---|---|---|---|
| | Musicality | Like/dislike | Like/dislike |
| Performance | | | |
| Sedative | .419* | .517† | .441† |
| Stimulative | .225 | .401* | .452† |
| Expectancy | | | |
| Sedative | .099 | .331 | .329† |
| Stimulative | .015 | .348* | .453† |
| Concentration | | | |
| Sedative | .141 | .474† | .447† |
| Stimulative | −.075 | .577† | .417† |
| Worry | | | |
| Sedative | .075 | −.320 | −.151 |
| Stimulative | −.242 | −.518† | −.342† |
| Emotionality | | | |
| Sedative | −.008 | −.280 | −.309* |
| Stimulative | −.128 | −.465† | −.259* |
| Like/dislike | | | |
| Sedative | .517† | | |
| Stimulative | .316 | | |

*$p < .05$. †$p < .01$.

scale administered to psychology majors correlated positively with the like/dislike scores and with performance only in the case of sedative music.

Findings for the variables of concentration and performance were more complex, each involving a significant three-way interaction ($F_{12,150} = 2.49$ and 1.87, respectively, $p < .05$) and a significant effect of music conditions ($F_{3,150} = 9.53$ and 9.08, respectively, $p < .001$). For concentration, all groups combined, means were significantly higher for no music than for sedative music ($t_{59} = 2.89$, $p < .05$) and higher for sedative than for stimulating conditions, as expected ($t_{59} = 1.85$, $p < .05$, one-tailed). Exceptions to these general trends account for the three-way interaction. Differences between no music and stimulative conditions held for seven of the 10 music groups, i.e., all except psychology majors—easy listening, music majors—country/bluegrass, and music majors—jazz and blues. Differences between sedative and no music held for six of the 10 groups, i.e., for music majors—classical, music majors—jazz and blues, and for all psychology majors except easy listening. The latter group is the only one in which a reversal of the general trend occurred, with sedative music producing better concentration than no music. Stimulative-sedative differences held for three groups of music majors, i.e., country bluegrass, easy listening, and rock/rock and roll. It appears that the distracting effect of both stimulative and sedative music on psychology majors was the most consistent effect to be observed in these data except in the case of easy listening music. In contrast the

distracting effect of stimulative music was greater than that of sedative music for music majors for three of the five types of music. Finally for psychology majors easy listening music, whether stimulative or sedative, was less distracting than any of the other four types of music.

Results indicate that (a) worry scores were higher for stimulative than for sedative music, (b) stimulative music was liked less than sedative, (c) expectancies were lower under stimulative than sedative conditions for music majors, and (d) concentration was poorer for music majors subjected to stimulative than sedative music. Despite these findings differences in performance means between stimulative, sedative, and no-music conditions, though in the predicted direction, did not reach conventional significance levels ($t_{59} = 1.61$, $p > .10$). The three-way interaction is accounted for by exceptions which may be noted in three specific groups. The effects of sedative easy listening music (as compared to no music) were positive for psychology majors but negative for music majors. Stimulative music produced a negative effect (as compared to no music) only for rock/rock and roll—music majors. With the exception of this last group, it appears that subjects are capable of performing well in spite of disliking the music, having difficulty concentrating, worrying more and expecting less.

## Discussion

The effects of stimulative and sedative music on the cognitive (worry) and affective (emotionality) components of test anxiety have been clarified by the findings of this and the previous (Smith & Morris, 1976) study. It was initially unanticipated, but now clear, that (a) the incremental effect of stimulative music on anxiety is as great or greater (Smith & Morris, 1976) than the decremental effect of sedative music, and (b) that the effects of music on the cognitive component are as great or greater (present study) than on the affective component of anxiety. Regarding the latter, there was a nonsignificant tendency toward a stronger effect of stimulative music on worry than on emotionality in the earlier study, and this difference was significant in the present study. The within-subjects design used in this study was more powerful in elucidating these effects in that each subject experienced both stimulative and sedative music conditions and finer discriminations between the effects of the two were made.

An important conclusion to be drawn is that the effects of music are to be understood in terms of cognitive processes such as worry, expectancy, and concentration, rather than primarily on the basis of the arousal or reduction of physiological-affective responses to musical stimuli. Any person variable which affects these cognitive processes, i.e., ability to perform the task, familiarity with the music, and differing modes of processing evaluative cues and handling distraction, should affect one's anxiety and performance under music conditions.

Concerning performance effects, the hypothesis that stimulative music would have a negative effect was not generally supported, nor were there sig-

nificant differences found in the Smith and Morris (1976) study. In the two studies conducted, both an actual course examination and an individual-intelligence-test setting have been used. The effects of stimulative and sedative music have been explored using both a between-subjects and a within-subjects design. While music conditions have definite effects on cognitive processes, these studies offer no support for the contention that music is a strong determinant of performance differences *per se* in the intellectual sphere.

Looking toward future research, it is helpful to know from the results of these two studies that the five types of music utilized did not contribute much to our understanding of the effects of music. However, the use of specific types of music in conjunction with the musical preferences of the subjects should be fruitful as indicated by the correlations of the like/dislike variable with other variables. Likewise, the differences between psychology majors and music majors on many of the dependent variables reached borderline significance and definitely deserve further attention.

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