THERAPEUTIC
AND INDUSTRIAL USES
OF MUSIC
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A Review of the Literature

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In the summer of 1944 the writer was asked to make a survey of the literature on music therapy. The search was begun with the current publications, and it soon became apparent that many of the articles which lauded the efficacy of music therapy were written by people whose knowledge of the subject was confined to an interest in music and who wished to bring to the hospital patient a measure of the relaxation and enjoyment that they themselves experienced when playing or listening to music. Little attention was paid to the medical aspects of the problem. The search was then carried back to the experimental work bearing on the use of music, in an attempt to trace the reasons for the belief expressed in some of the articles and to determine the purpose of the original investigations on which these claims were based.

The factory environment lends itself to more precise measurement than is possible in a hospital setting. Some progress had been made in devising experimental techniques for the investigation of the psychological effects of music, and it was felt that some of the results from industry might be applicable to a study of the medical use of music.
It was evident, however, that if one wished to understand the patient as well as his needs it would be necessary to go even farther afield. Investigators interested in the objective study of the problem have shown the need for a re-examination of the basic principles that determine the effectiveness of any therapeutic measures. This trend is just discernible in the literature now appearing on functional music.

The writer was graciously permitted to incorporate in the present review the material selected for the previous report, and she wishes to take this opportunity to express her gratitude to the Josiah Macy Jr. Foundation and to Dr. Frank Fremont-Smith, its Medical Director. She also wishes to thank Dr. Thomas A. C. Rennie for reading the manuscript and encouraging its publication. Grateful acknowledgment is hereby made to the authors, editors, and publishers who have generously allowed her to quote from their materials. Her thanks are also due to the librarians who have given her the opportunity to search through their collections. The writer also wishes to express her appreciation to the staff of Columbia University Press for their co-operation and to thank especially Miss Ida M. Lynn, the Assistant Editor, for giving of her time and expert professional knowledge.

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THERAPEUTIC
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INTRODUCTION

The literature on music therapy is both voluminous and restricted, for this subject has attracted the attention of many writers from the beginnings of music and of medicine, and reports concerning it are to be found in almost every type of popular and technical journal. However, the field of original work is limited. Whether definite healing influences may be attributed to music has not yet been thoroughly studied, and much of the material to which the term "therapeutics" is applied is only remotely related to that purpose. Many writers who advocate such a use ignore the meaning of the term "therapy," the purpose it is intended to serve, and the fact that only members of the medical profession are qualified to determine what should be the proper therapy in a given instance.

One cannot pick up an article on the therapeutic value of music without running into examples from the Bible, or references to mythology and mysticism, cult medicine, and pseudo-science; only occasionally is there an authentic experiment. When the whole range of human experience is thus covered, it is not hard to find many instances in which music has seemed to work mir-
acles in curing the sick, or at least in preparing the mind to accept the current cure. At certain periods its advocates have tried music either for specific disorders or in the belief that it would help all patients. The circumstances under which music therapy was introduced in certain places has sometimes resulted in sufficient publicity to bring it into more widespread use elsewhere, but with the disappearance of the immediate need, its importance was again forgotten.

The present, when so many agencies have become interested in serving returned veterans and in aiding the morale of factory workers, is an example of such "immediate need," and interest has been reawakened in the entire subject. According to the published accounts little concerted effort has as yet been made to co-ordinate its various phases, but studies are being carried on by different groups, each emphasizing some particular aspect of the problem that is related to its individual endeavors.

This survey is not intended to cover all the literature available. Articles on music therapy and industrial music have appeared in every type of publication. The aim has been rather to obtain examples relating to various aspects of the subject and to cite the opinions of different groups, private organizations and official agencies, those concerned with the civilian population, and those interested in military hospitals or veteran facilities. These include references from the fields of music and musical education, physics, engineering, medicine, psychiatry, psychology
and sociology, occupational therapy, and industrial relations, together with some explanations of the effects of music as interpreted by these professions in the light of their special practice.

An attempt has been made to gather those publications that deal with experimental work of any kind, so as to emphasize whatever factual data exist on the value of music as a therapeutic agent. To this end, items concerned with the practical application of music whose records might supply such data have also been treated more fully, although many of them are in effect of an empirical nature.

In several instances the material relating to experiments has been quoted directly so as to convey as accurately as possible the investigator’s objectives and point of view, but only a small portion of each citation could be so treated, and space limitations have permitted only scant reference to procedural details.

Publications on music in industry have also been covered, because this is a field in which experimental work on the psychological effects of music programs can be ascertained by means of the “performance index.” Some of the findings obtained in an industrial setting, whether they relate to attitudes of personnel or to the practical problems of acoustics and equipment, may suggest a point of departure for the study of music in medicine, just as the results of clinical research on fatigue have been applied to office and factory.
References to experiments on animals and discussions on the use of music for children have been omitted. Articles which have appeared in popular journals or in newspapers and items in other publications of an ephemeral nature have also been excluded because many of these, of necessity, duplicate reports published in original communications elsewhere. Preference has been given to publications that are most easily accessible in general or medical libraries.

To facilitate the use of the bibliography, the selections for each author have been restricted, with the exception of those items that cover an investigator's original work or contain a fuller account of the subject matter as a whole.

Since one of the objectives of this survey was to search out any studies carried on under controlled conditions, and since most of the early references are concerned with theoretical speculation or observation of a "cure" by music unsupported by verifiable evidence, selections have been restricted as much as possible to recent material. Only such references as are required to clarify some later citation or whose work is here reported, have been included in the bibliography. However, some of the items listed contain reviews of the older literature and thus provide a more complete résumé of what has been published. These are noted in the text and in the bibliography.

Greater emphasis has been placed on the literature of the period following the first World War and that ap-
pearing from 1943 to the end of 1947. In both those pe-
riods the question of music was more closely examined for
its possible influence in veterans' hospitals and in war
plants, with the resultant spread of interest to other ap-
plications in medicine and in industry.

Current studies and reports of research in progress have
also been noted.

The literature has been presented in chronological
order where continuity permitted, so as to indicate the
trend of the discussions over a period of years, the cur-
rent status of music as therapy, and its use in industry,
as well as the development of any new approach that
favors a more objective study of the subject.
CHAPTER II

OPINIONS BASED ON
EMPIRICAL METHODS

The greater portion of the literature advocating the use of music falls into the category of empirical writing. It is concerned with the value of music as a form of entertainment, as a therapeutic agent for those suffering from physical or mental ailments, as a morale builder, and as a socializing force that aids in getting the patient to take part in other activities. Many of the articles simply refer to the older literature, quoting authorities who have reported successful treatments, and on the basis of these reports, they suggest that music can serve as a valuable therapeutic agent. These authors in turn are quoted by other writers; see Knott (1911), Robinson (1918), Grothe (1926), Vescelius (1927), Codellas (1930), Ilsen (1930), Meese (1930), Duggan (1934), Yearsley (1935), Ligeros (1937), Bronson (1942), Eyer (1943), Antrim (1944), Podolsky (1945), Simon (1945), Jacoby (1946), Piper and Winchester (1947), and many others.

A poetic reference by the ancients to the “sweet influence of the lyre” becomes for some music enthusiasts a testimonial to music’s power as healer. Those who quote
Saul's favorable reaction to David's harp fail to mention the times when David's playing aggravated rather than assuaged the king's malady. According to Licht (1946), the ancients regarded the Dorian mode as virile, energetic, and proper for the perfect citizen. That they considered music suitable for the cure of mental and physical ills is not surprising, for they attributed similar characteristics to many other intangible elements. Later writers, when they could not explain the effect of music in any other way, even invented a vehicle for its action. Chomet postulated the existence of a "sonorous fluid" in the body by means of which it was influenced for good or bad by the vibrations of musical sounds.

One of the phenomena often referred to as a proof of cure by music is the relief of the madness caused by the bite of a tarantula, which attracted much attention in the Middle Ages. Sigerist (1943), an eminent authority on medical history, provides an insight into what really happened when he says, in discussing the disease he calls tarantism, "It was frequently mentioned in medical literature, but mostly by people who knew it only from hearsay." The disease seems to have been endemic to the region of Apulia, with a scorchingly hot, dry climate, and it occurred in July and August. "Music and dancing were the only effective remedies. . . . As a rule . . . musicians were at hand. It seems, as a matter of fact, that the spiders were particularly aggressive when the musicians were around and that music more than
the summer heat was responsible for reviving the old poison in the system of former patients." The bite of the tarantula had no such effect elsewhere; in fact, the neurotic manifestations were only evidences of an inbred region. This region had once known the Greek tradition, and to show their relation to these Greek cults Sigerist lists some of the songs that were used.

So convinced are some workers that music is beneficial for everyone that when music appears to be distasteful to some patients an effort is made to change their attitude rather than to find out what it is in music that affects them adversely. A striking example of this is the experience of a physician (Agnes Savill, 1924) who until the age of thirty felt only boredom when compelled to listen to any type of music. She forced herself to study the appreciation of music intellectually, and finally a combination of aesthetic dances and the concerts of a noted pianist awakened an emotional response to melody. Then she wrote a book advocating its use as a therapeutic aid.

The period following the first World War saw a resurgence of interest in the value of music, especially for shell-shocked veterans. How the various military and civilian institutions applied this form of therapy will be discussed in Chapter VI.

Many attempts have been made to explain the total effects observed by analyzing the attributes of the musical elements. In a volume entitled *What Music Does to Us*, Benedict (1924, p. 17) writes: "Rhythms are for con-
ducting our train of thought away from all unhappy things that beset us. They convert our thought impulses into mere motion. It is motion with no particular thought purpose. During a performance of rhythms one's intellectual processes are probably the nearest to being nil that one can arrive at outside of sleep itself. Hence the rest we derive from the pursuit of rhythms. Nothing, of course, is to [be] gained from remaining in them save rest. . . . [Rapid rhythms] act as a counter excitement."

Larson (1928) believed that music arouses various emotions, but "our actual knowledge of the physiologic effect of music is on the whole very vague. . . . It appears that the human organism participates in that tendency to vibrate synchronously with music which is known to obtain in the inanimate world." Rhythms may be heard, seen, and felt. He cites Billroth's statement that "rhythmic movements are among the most important properties of our body and are necessary to life. . . . It is probable that all muscular movements . . . are brought about by a summation of numerous infinitesimal and imperceptible rhythms."

It is true that these are not all arm-chair deductions. They are based to some extent on clinical observations and related studies. Practical experience in hospitals and institutions for children and adults has demonstrated the validity of some of these claims for certain types of patients.

Harting (1919) cites an instance of a patient in an
insane ward who could not be reached at all. When a vocalist sang "a sweet melodious song," the patient ceased his maniacal activities. "At first there was nothing but silence; then I seemed to see an interest creep into his being. A healing influence had reached him by virtue of the music." Another case is that of a mountain boy who was slowly dying. He first showed interest in living when he heard a banjo played; then he expressed a desire to try his hand at this instrument, which he had previously used.

Larson (1928) writes that "as early as 1878 at the Randall's Island Asylum, New York City, an important experiment was conducted when 1,400 mentally ill female patients . . . were congregated in the large entertainment hall of the institution and subjected to a strain of piano music for a half hour, when the general effects were noted. Taken as a whole, the results of the experiments were beneficial and by frequent repetitions many of the patients showed great improvement. They were all susceptible to rhythm, while melody without any decided tempo was without effect excepting when the force of association was still active." He recalls the observation of Hunter (1892) that through vocal and instrumental music in a mental institution, "The cessation or at least diminution of pain has been very marked in some cases, seven out of ten noted cases were benefited by reduction of temperatures."

Davis (1929) cites the case of a veteran (diagnosed
manic depressive) who had previously studied piano and was finally induced to accompany the hospital orchestra. This revived interest gradually encouraged him to take up handicrafts, and he was found to be still working, well and apparently happy, two years after his discharge from the hospital. His first return to the piano, however, was accomplished only after he had left the hospital for a visit to his home; he had previously resisted all urging.

Many writers, without further evidence than that referred to above, express the opinion that “Music is good for the soul,” “is a moralizing influence,” “can be made available to all,” “acts as a disciplinary measure,” “brings the players [in an orchestra] into close association,” “is emotionally uplifting,” “has educational qualities.” As one writer put it (Harting, 1919): “Frequently it is the spark which kindles those higher impulses in men which, sympathetically fostered, develops into the big, noble qualities.”

Grothe (1926) said: “... A patient listening to music can be relieved of pain, fear, terror, grief, rage, and in its place there will initiate and energize joy, love, tenderness, mirth, martial spirit and rhythmic dance. ... If musical games are used the patients have an opportunity to release all the activities of their ancestors; their every mood and movement is instinct with heredity.”

Such writings are evidence that the emotional component of music that is said to be such a potent factor in its effect on the patient has permeated the thinking of
many who advocate its use as therapy, for some of the articles grow lyrical and flowery.\footnote{See, for example, the booklet by Vescelius (1918), in which she stated:}

It is, perhaps, for this reason that the therapeutic use

\footnote{The employment of music in the treatment of disease is an ancient practice, dating back to the time when David took his harp and played before Saul\textsuperscript{1} (p. 1).}

\footnote{We are organized vibrations. The object of all cures is to change discordant vibrations to harmonious ones. Disease is unrhythmical, health is rhythmical, for rhythm is a fundamental law of the universe. The music cure is based upon the law of harmonious rhythmical vibrations. Its appeal is to the soul\textsuperscript{2} (p. 3).}

\footnote{Seymour (1920), who often referred to the work of Vescelius, wrote:}

\footnote{Some years ago a movement was started by Eva Vescelius for healing through music. . . . We . . . determined to test its possibilities by jotting down a word or two, such as courage and hope . . . . Taking such a phrase as "infinite goodness," some one played softly and rhythmically to the group for about five minutes. Soon the music had its effect upon both player and listeners. Through such experiments we found that music was one of the greatest helps in accomplishing constructive meditation\textsuperscript{3} (p. 146).}

\footnote{Heline (1943) explained her belief in the efficacy of music therapy as follows:}

\footnote{The processes of creation or construction are all dependent upon the vibrational power of tone. The universe is builted to music, said the Kabbalists. . . . The twelve semitones of the chromatic scale and the seven notes of the diatonic are numeral divisions corresponding to the cosmic pattern of our solar system and the zodiac, respectively. In our immediate cosmic environment the twelve signs of the zodiac serve as the sounding board for the music played by the seven planets native to our solar system as they circle around their parent sun. . . . (p. 5).}

\footnote{Man's threefold body is linked to the threefold spirit by means of the mind. As previously stated, each of these vehicles or principles sounds a keynote of its own. If these notes be altered so as to create a dissonance between the bodies great enough to cause a rupture between any two of them, the result is some form of mental derangement. Music in the correlated keys will prove beneficial in the treatment of these various forms of mental aberration. From the type of insanity may be diagnosed the nature of the mental break after which the case can be beneficially treated by music\textsuperscript{4} (p. 22).}
of music early attracted some musicians who were unfamiliar with psychological, welfare, or occupational therapy techniques; their enthusiasm stemmed from the personal satisfaction obtained in providing entertainment for those who were isolated from normal contacts.

At stated intervals, more often during the holidays, a group of musicians, perhaps a pianist, a violinist, and a vocalist, would perform in each ward or in an assembly hall. The program would be made up of selections considered by them suitable because of their soothing or relaxing or entertainment qualities. The success of these programs would be determined by empirical methods, based on the musical director's experience and observation of the patients or on the personal reactions of the performers themselves to the music.

It would be a mistake to minimize the value that such service has had in bringing about a favorable atmosphere. In some institutions, especially the custodial type, the introduction of music was the first recreational activity provided for the patients; the response was therefore seemingly miraculous. It is also true that music may aid a patient indirectly and thus contribute to his well-being and recovery. But there have been few controlled experiments to determine the characteristics that make for such rapport between patient, music, and environment as to produce a favorable and lasting effect from the point of view of clinical recovery. The error lay in concluding that the goal of musical therapy has been reached by
empirical methods, in advocating the same treatment for other patients before the manner of its action was known, and in permitting nonmedical personnel to prescribe the treatment.

So much writing has been based on mere opinion or on results obtained on a single subject, that even among the early writers a few were critical of claims made for music as a healing agent. Hanslick (according to Diserens, 1926) wrote in 1891: "Every cure effected by the aid of music must be regarded in the light of an exception and the success can never be put down to music alone, being due partly to special causes and often merely to the patient’s idiosyncrasy."

This statement emphasizes the point that from the earliest times the role of music has been complementary and has served rather as the vehicle by means of which the magic of the medicine man was conveyed to the patient in an acceptable manner or has functioned as a counterirritant when more forceful treatment was required (Diserens, 1926, p. 89; Sigerist, 1943, p. 212).

In recent times, also, even the strongest advocates of musical therapy do not rely on music as an actual cure, but urge its use as a palliative or preparatory measure. A few have urged that it be used with caution. Jancke (1928) called modern theories of music therapy a mixture of psychophysiology and metaphysics. He states that the influence of music depends on association and that the environment plays a role in its effect. The Jamesons
(1933) considered that musical therapy, in spite of its long and often successful practice, has not been systematically and scientifically utilized in our culture. It has so much versatility that it may be useful for everyone at certain times. The stronger the emotional make-up of a person, the more strongly music seems to affect his life. They warn, however, that its limitations must not be ignored. It is not a “cure-all”; and not everyone responds to its healing power.

A similar warning was sounded by Eisenberg (1935); and Treves (1927) called attention to the fact that many nervous patients, especially those affected with hysteria, had a pathological aversion to music and that certain melodies produced severe disturbances because of unpleasant associations.

Several cases have been reported by Critchley (1937), Taylor (1942), and others, in which a person subject to epilepsy has suffered an attack upon hearing certain musical selections which aroused strong emotions in him.²

Roberts (1936), whose statements are based on her experiences with the music of “primitive peoples in action,” found that “certain rhythm music with smooth, flowing quiet quality, when combined with beauty of smooth melodic line arouse aesthetic emotions—contemplative, serene, moving, but quiet, and happy or sad as

² Sear (1946), however, writes that “actual cases cited by an authority [Critchley] are all open to the same criticisms . . . that all the musical instances are too vague in their nature to be allowed as specifically precipitating causes.”
the case may be. . . . The vigorous, rapid, markedly pulsing rhythms . . . have exactly the opposite effect. . . . It must be recognized that in music lies one of the strongest integrating (and I would add, in many cases one of the strongest disintegrating) forces we know.”

She believes that the soundness of much of so-called musical therapy is to be seriously questioned. Music has considerably bettered the condition of some mental patients, at least temporarily, but less has been said about those who were not improved, though many such have been observed. Patients are usually not tested for response to well-defined types of music, nor are case histories consulted to learn whether music or noise may not have contributed to their emotional disturbance.3

There is the possibility, too, of enhancing the feeling of depression under certain conditions, according to Kraines (1943, p. 59), merely because the music emphasizes the contrast between the patient’s personal problems and the seemingly happy state of the outside world.4

Edwin Hughes, then president of the National Music Council, in a talk before the Music Library Association in 1942, asserted that “the use of music for therapeutic purposes is a matter in which mountebankery strides side

3 See also, in this connection, Allen’s comment on the case report mentioned on p. 94.
4 Assaglioli (1933) decided that certain music is detrimental and may even be instrumental in initiating malaise, but he makes an arbitrary distinction between harmful and beneficial selections that gives the impression that his statements are based on other than scientific grounds.
by side with genuinely scientific procedure, and where the spurious can with difficulty be separated from the true. More light is needed on this dim subject” (Hughes, 1943).

At one of the meetings of the Music Teachers National Association van de Wall (1944) asked that care be taken not to exaggerate the therapeutic significance of musical programs as at present organized for the sick and the wounded. He said, “We should also remember that there are moments in our lives, even in good health, when music is not welcome, when it is grating and irritating, despite the fact that our general disposition towards music is positive and favorable.” Until more knowledge is available and qualified persons have received the technical training needed to give that knowledge practical application under proper medical control, it will not be legitimate to use the terms “musical therapy” and “musical therapist.”

Dykema (1945) believes that the social effects of not being isolated are as potent as the music itself, and suggests that “music in therapy” be substituted for the term “music therapy,” because music is only a part of other therapies.

Licht (1946) also warns against unqualified acceptance of statements made by others as to the value of music as therapy. Such statements might be interpreted in quite other ways, music being merely “an environmental coincidence.”
Sear (1939; 1946) severely criticizes those who have investigated the possible use of music in therapy for accepting without question the validity of reported cures when no scientific justification for such claims exists. In most instances the medical treatment—which was the determining factor in the cure—is overlooked in these reports. Although tastes in music have changed throughout the centuries and the instruments also have been modified, it is assumed that patients will now be affected by a melody in the same manner as were, presumably, those who first heard it. The patient’s attitude toward a particular musical selection has a greater effect than the playing of the music itself. “Music sad in character may drive up pulse rate and pressure if it be deeply felt by the subject. Yet the most exhilarating music may bring both low if the patient does not like it.”

Those who have studied objectively other phases of the application of music have also come to the conclusion that “the current well-intentioned efforts at investigation have to date served only to indicate rather than to prove” (Burris-Meyer and Cardinell, 1946).

Although articles advocating music as therapy on no valid grounds are still being written, the number of such articles is gradually diminishing. The editor of the musical journal *The Etude* published the following statement in the March, 1945, issue: “*The Etude* will review from time to time the investigations made by serious minded workers in the field of musical therapy, but our readers must know that nothing can be represented as a ‘cure’ or a remedy until it has been given the fullest confirmation by the medical profession.”
CHAPTER III

EXPERIMENTS ON PHYSIOLOGICAL EFFECTS

That music has the power to modify to some extent the condition of the individual has been demonstrated by a few investigators. Two broad divisions may be noted in the literature dealing with the experimental approach to the study of music as it affects the physiological or psychological processes.

One type of experiment is concerned with the measurement of changes in pulse rate, blood pressure, and respiration, readings of each being taken before and during the playing. The second type is concerned with the effect a particular kind of music has on the mood of the listeners, subjective reports as well as objective analyses being recorded for the group under observation.

The two types are often presented in the same report, but here the literature has been arbitrarily divided to facilitate the understanding of the reasons offered in support of the claims for music therapy.

A related group of experiments will be discussed in Chapter IX.

Much of the early experimental work would hardly be considered objective according to present standards.
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The experiments with music, although given as proof of its effect on the patient, frequently were incidental to some problem not related to therapy, consisted of a single-tone stimulus, or were confined to recording the reactions of one individual. Some of the records obtained might have been the result of other behavior factors. Many of these investigations were carried on in a period when concepts and methods in psychology were changing. The interpretation of the results were then weighted with the fallacies inherent in the principles involved, and sometimes accepted without their validity being questioned.

Some workers believe that the relation of music to physiological processes will not be known with certainty until more adequate techniques are available for studying complex behavior. Among those laboratory aids that have furthered the study of human behavior may be cited the use of the Einthoven string galvanometer, which enabled Hyde and Scalapino in 1918 to measure for the first time the contrasting cardiac excitations during their experiments with music and enabled them also to analyze changes in pulse rate and blood pressure (Schoen, 1927, p. 186). Another example is the use of the encephalogram in the study of musicogenic epilepsy (Critchley, 1937; Taylor, 1942) and disturbances of musical function after accident, such as those reported by Ustvedt (1937). Other instruments developed in the fields of medicine and
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physics promise a more accurate approach to the study of the emotions in the psychological laboratory. Margolin and Kubie (1943) described a method for the study of respiration through the graphic recording of the breath sounds by means of an "acoustic respirograph." The apparatus which they used in the investigation of sleep and emotional states makes it possible to observe any changes in respiration without the subject's being aware that he is being studied. An instrument now being tested for possible application in various fields is the sound spectrograph, a wave analyzer that translates the spoken word into permanent visible patterns (Steinberg and French, 1946; Koenig, Dunn, and Lacy, 1946; Potter, Kopp, and Green, 1947).

A procedure in medicine advocated by modern physicians as well as by those of an older era, namely, the psychosomatic diagnosis of the patient, and the concepts of social medicine, just beginning to be explored, have been more often employed in psychiatry, but have equally important application in psychological research (see "The Basis of a Classification of Disorders from the Psychosomatic Standpoint," by Kubie, 1944, the review of the psychosomatic literature by Dunbar, 1946, which contains some 2,400 references, and the publications of the Committee on Medicine and the Changing Order of the New York Academy of Medicine).

Recent refinements in the techniques of experimental
psychology and sociology also offer better means of studying reactions in response to musical stimuli and of evaluating their therapeutic effect without too great a dependence on empirical methods.

Diserens (1926), for one, finds that music does have a profound effect on behavior. Objections to its use are based on the belief that its effects cannot be controlled, and this belief, he states, is erroneous, for the problem does not present insurmountable difficulties. Control is possible, though not yet achieved. To the objection that cures by music are effected through mental association, Diserens (1926, 1939) cites the use of music by primitive people “wherever a powerful emotional effect is intended and particularly in the treatment of disease.” There is “plenty of historical evidence for the use of music in the attempt to cure diseases.”

But it has been held that “the theory back of the original application of music is metaphysical and the observed influence may [therefore] be the result of purely mental association.” To which Diserens replies that drugs, no less than music, were supposed to do their work by expelling the evil spirits that were the cause of illness. “The point is that in spite of primitive theories, it is probably only that which is successful which is retained” [from primitive therapeutics]. (1926, p. 90.)

“Thus the long persistence of musical therapy in belief, and in practice, is almost proof that music produced
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direct physiological reactions in the organism, which are responsible for the belief, rather than an explanation of the practice.”

Moreover, Diserens argues, any study of behavior involves the psychological approach, and since the experimental psychologist presupposes "essential psychological identity of groups . . . when he draws conclusions from the behavior of a controlled group," it may be assumed that "the genetic and comparative method in dealing with social facts has something in common with experiment, and the data amassed in this way are complementary to the data derived from the investigation of individual behavior. . . . By this method a considerable amount of data respecting response to music has been brought to light, and we have referred to laboratory experiments only in order to point out their agreement with sociological data, or to explain certain musical effects" (1926, p. 125).

The older experiments referred to have been repeatedly cited in the literature, and details of the investigations conducted prior to the first World War will be omitted. Only enough detail has been condensed from the later experiments to show the type of experimental set-up employed and some of the results obtained. One of the most comprehensive reviews of the older litera-

1 Three other theories regarding musical therapy are discussed: the metaphysical, the psychological, and the physiological (Diserens and Fine, 1939, p. 164).
The first observations on the physiological effects of music which partake of the nature of experiment seem to be due to the French musician, A. E. M. Gretry (1741–1813).” He simply placed the fingers of one hand on the artery of the other and noted the change in pulse pressure while he sang at different tempos. The pulse quickened or slackened its action to accommodate itself by degrees to the various tempos in which he was singing.

In 1880 Dogiel tested the influence of music on the circulation of the blood by means of the plethysmograph. Diapasons of varying pitch . . . and a serenade of Schubert’s on the violin, clarinet, and flute were employed as auditory stimuli. The general conclusions of Dogiel’s study are as follows: Music exhibits an influence on the circulation of the blood. . . . Blood pressure sometimes rises and sometimes falls, [depending] on the influence of the auditory stimulus on the medulla oblongata, [as well as] on the idiosyncrasies of the individual. The action of the musical sounds expresses itself . . . for the most part by the acceler-
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tion of the cardiac contractions. . . . The variations of the circulation . . . agree with the respiratory changes . . . and depend on the pitch, intensity, and timbre of the sound.

P. Mentz (1895) conducted experiments on the influence of auditory stimuli on the movements of circulation and respiration under varying conditions of attention. The apparatus used was the Marey sphygmograph and the pneumograph. He found that an auditory stimulus—noise as well as simple sounds—produces a retardation of the pulse and a retardation or acceleration of the respiration, correlated with the duration of the stimulus and the presence or absence of voluntary attention. The intensity of the auditory sensation increases the duration of reactions to a certain limit, beyond which reactions diminish.

In connection with the study of the capillary circulation of the hand, carried out on four subjects by means of the Marey sphygmograph and the plethysmograph, [A. Binet and J. Courtier (1895)] found a diminution of the amplitude of the pulse in response to the sudden sound of a gong.

Binet and Courtier also investigated the influence of musical stimuli on the respiration and circulation of a single subject.

In one series of experiments, isolated tones, chords, and musical exercises possessing no intellectual or emotional association were used. These sensorial stimuli produced no respiratory modifications, except an acceleration of 0.5 to 3.5 additional respirations per minute. The acceleration varies directly with the liveliness of the movements, and is greater for the minor mode and discordant sounds.
Musical selections, chiefly songs, arousing emotional associations according to the introspections of the subjects, vary in their influence. . . . Sad melodies accelerate respiration . . . diminish the amplitude, and produce irregularities in both acceleration and amplitude of respiration. Gay music . . . produced an acceleration . . . and showed less tendency to reduce amplitude. . . . A third class of melodies evoking complex and unclassifiable emotions . . . produced an acceleration . . . with a tendency to reduced amplitude. With respect to circulation, purely sensorial excitations produce a slight lessening of the amplitude of pulsation. Dissonances produce a greater effect. Sad music has almost no influence, while gay music nearly always provokes a reduction.

The rate of the pulse remains constant or increases, in the case of simple musical elements, as much as 6. Melodies produce an acceleration ranging from 0 to 15. Finally, gay music produces an accentuation of dicrotism, sad music the reverse.

Similar experiments were repeated in 1898 by Gui- baud, who, however, used several subjects. He concluded that not all persons react in the same way to similar musical stimuli, whether simple or complex. Moreover, some subjects react to every kind of musical stimulus, while others react only to certain ones. Reactions to dissonances produced by simple tones, chords, and scales were more marked and frequent in the majority of cases, although those who were habituated to modern music did not so react. When musical selections were used, vascular and respiratory reactions varied still more. The
vasomotor phenomena seemed to agree with the feelings experienced by the subjects during musical stimulation.

Vaschide and Lahy (1902) analyzed the value and the significance of the two coefficients of organic response, circulation and respiration, as developed by previous investigators. They organized the data into two tables, one showing the influence of musical elements on organic reactions, the other exhibiting the variations of organic functions in relation to the general effects of music. From these they reached the following conclusions:

The repetition of a musical stimulus diminishes and finally banishes peripheral reactions. Musical rhythm produces by suggestion a mechanical action in respiration. In general, respiratory rhythm follows that of the music, increasing or diminishing with the latter, without going beyond the limits of extreme variations. Melody only produces variations in organic functions, insofar as one of its elements (rhythm, mode, timbre, intensity) changes. Monotonous melody produces no peripheral changes. . . . The brain temporarily increases in volume in response to all musical stimuli.

Later experiments on thoracic breathing were conducted by Foster and Gamble (1905; 1906). Gamble made 155 stimulus tracings for twenty subjects, while hymns, chorals, and "elaborate compositions" were played on an organ. She found the results of doubtful validity, but suggested that respiratory functions are influenced by musical rhythm.

In a second experiment, with twenty-nine college
women, four tests were made to determine the effects of loud and soft music, in major and minor keys, the organ again being used. The data indicated that musical stimuli do not markedly affect the regularity of respiration.

In 1896 Patrizi made use of a situation analogous to that which Beaumont had employed in studying digestion. A thirteen-year-old boy who had a healed skull wound through which the pulsations could be observed, provided this physician with the opportunity to study the changes in blood pressure, both in the general circulation and in the circulation of the brain.

The results were recorded on a kymograph. In general it was found that pulsations took a higher range after a musical note, or a very near repetition of the same note. High notes produced greater changes than tones of low pitch. . . . Every increase in pulse was related to musical stimuli, and the different amplitudes . . . seemed to depend on the relative intensity of the musical stimuli. Both cerebral and peripheral circulation were increased by the singing of the “Marseillaise,” while a polka augmented the cerebral circulation and diminished that of the arm in the same proportion. A “gallop” increased the cerebral circulation, while that of the arm remained unchanged, and great mental lucidity accompanied the music.

The depressing or exhilarating character of the music did not correspond to the deviations of the plethysmographic curve, and the circulatory effects were found to be independent of the respiratory. Patrizi is undecided whether the variations in cerebral volume were autonomic neuro-muscu-
lar functions, or passive reflections of general vaso-motor phenomena.

Féré and Tarchanoff had assumed an increase in volume caused by lively music, contrary to the above findings.

Shepard (1906) had a similar opportunity to study the effects of music upon an individual with a pulsating cerebral scar. In this subject, "a musical chord produced a decrease of volume of the hand and pulse, while the volume and pulse of the brain increased."

He conducted many other tests on a group of six subjects, recording fall of volume and lower pulse resulting from use of music which the subjects classed as pleasant, agreeable, stimulating, and exciting. In one series with five subjects, seven trials of music which was classed as agreeable and exciting, "resulted in a faster rate with a marked increase. In four cases of agreeably depressing music, the pulse was shortened. In sixteen out of eighteen cases in which the stimulus was a loud unexpected whistle of a disagreeable exciting nature, there was an acceleration of the pulse. Agreeably exciting or depressing music also tended to eliminate the Traube-Hering blood pressure wave, and the rate of breathing was almost always increased for all stimuli."

When Ferrari (1897) employed Patrizi's technique in the study of capillary circulation of normal, feeble-minded, and idiot subjects, the results led him to conclude "that the vasomotors are active after a musical emotion only when the individual is in a state of psychological
inferiority; when the superior psychic functions have vanished; and when mental coordination ceases to inhibit emotion. In short, the effect appears when an organic disorder exists.”

In 1912 Weld secured plethysmographic and pneumographic recordings of the thoracic and abdominal respiration of eight subjects, in a study of musical enjoyment under “controlled introspection.” Various phonograph selections were employed.

The author notes that the act of listening to music was attended by a decrease of the volume of the forearm in 90 percent of the cases. . . . In auditors of an active temperament, the initial drop in the volumetric curve is abrupt; in those of a phlegmatic type, it was gradual. “The heart rate was usually accelerated, the acceleration beginning during the first few seconds and persisting throughout the music.” There was in general no correlation between the tempo of the music and the change of heart rate, even the slowest musical tempos, which were much slower than the normal pulse, produced an acceleration of the pulse, and the most rapid tempos had no more accelerating effect per se than the slowest tempos. The author, therefore, ascribes this effect to the influence of expectation. . . . The most striking changes in the respiration of the music period are acceleration of rate, and irregularity of amplitude. . . . There is no correlation between musical tempo or phrasing and respiration. . . . The respiration of auditors characterized by active attention became more rapid and was irregular in rate and amplitude, respiration tending to follow the music.
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Among these early experimenters, some observed that music decreases the effects of fatigue, increases muscular activity, and produces exaggerated knee jerk (one subject) and modifies the electrical conductivity of the skin. Reaction time was speeded, the threshold for color perception was apparently lowered by means of tonal stimuli, and judgment of weights was improved. In most instances the data are too slight to be very useful.

Ingegnieros, who made an extensive study of the experimental literature on the psychology of music to 1907, concluded that:

(1) Musical stimuli, like all sensorial excitations, determine an increase of the general physiological activities of the organism. The influence of music is a fact experimentally demonstrated. (2) Musical stimuli in certain well-known conditions determine in the organism the transitory functional reactions which characterize an emotion. (3) Physiologically there do not exist functional reactions which are specific of the musical emotion. It is a matter of reactions common to emotions in general determined by music under certain conditions (Diserens, 1926, p. 96).

Two series of experiments with hypnotized subjects are reported by Warthin (1894) and De Rochas (1898, 1900). Warthin, who had observed what he termed self-hypnosis in people listening to Wagner’s music, hypnotized several persons and noted their reactions when “The Ride of the Valkyrie” was played on the piano. During hypnosis the pulse rose and respiration increased,
but changes depended upon the emotional temperament of the individual. De Rochas hypnotized only one subject and had him listen to “isolated tones, intervals, chords, scales, phrases, and entire selections of contrasting types. . . . The music of different composers provoked varying effects; that of Gounod is most effective in producing appropriate expressive mimicry, physiognomical changes, gestures, and attitudes.” The investigator concluded “that the phenomena observed are pure reflexes, set off by auditory stimuli without the intervention of the will.”

A unique experiment cited by Diserens is that of Stepanov (1915), who studied the influence of an auditory stimulus on dreams. The experimenter and his subject occupied adjoining rooms, and at intervals during the night the former played musical selections (chiefly from Wagner) on the piano, awakening the subject who reported her dreams through a speaking tube. Interesting facts were brought out; the behavior of the subject demonstrating that there was subconscious recognition although when awakened she could not name the selection. In some cases, in her knocking on the wall of the room to announce her presence at the speaking tube, the blows corresponded in time to the tempo of the music. In many cases dreams of a non-musical or even non-auditory character were evoked, indicating transformation of acoustic stimuli into visual images, a phenomenon analogous to synaesthesia.

In summarizing what he considered to be the amount of agreement appearing in the results of the various studies, Diserens (1926, p. 154) writes:
The fact is, of course, evident that music profoundly influences physiological reactions. But the direction and reciprocal correlation of these reactions are still matters of dispute in many cases. The following points seem generally agreed upon:

Music (1) increases bodily metabolism (Tarchanoff, Dutto); (2) increases or decreases muscular energy (Féré, Tarchanoff, Scripture); (3) accelerates respiration and decreases its regularity (Binet, Guibaud, Weld); (4) produces marked but variable effect on volume, pulse and blood pressure; (5) lowers the threshold for sensory stimuli of different modes. (6) It thus affords the physiological bases for the genesis of emotions according to the James-Lange theory and consequently influences the internal secretions according to the researches of Cannon and others. (7) The precise influence of different modes and types of music has not been determined, and waits upon an adequate classification of musical selections, which must probably proceed at first by introspective and statistical methods.

Diserens' own work was developed after a study of the data gathered from ethnology, comparative psychology, biology, and sociology, and has been reported by him in detail in his book *The Influence of Music on Behavior* (1926, pp. 155–205). He states: "The object of the investigation was to determine the influence of music upon certain typical forms and aspects of behavior which are of importance in the ordinary activities of daily life."

4 This material is also summarized in Diserens and Fine (1939), pp. 225–274.
One point not generally stressed is that one of the major purposes of this investigation was to determine whether music could be applied successfully as a regulating and stimulating factor in industry. But while some of the tests were undertaken with a view to their industrial application, they are also included here, because they were not performed in a factory environment, and the subjects were the same in all his experiments.

In contrast to previous workers, who focused their attention on affective processes, Diserens' main emphasis was on the voluntary responses and reactions of the striped musculature. The majority of the investigations therefore concern the effect of music of various types on such features of response as habitual voluntary reactions and voluntary reactions involving attention and judgment, with a few on involuntary reactions. He gives the following list of experiments:

(1) Fatigue and endurance by means of the ergograph and dynamometer. (2) Accuracy of movement, aiming being selected as the activity to be tested. (3) Speed of movement, as exemplified by handwriting and typewriting. (4) Graphic behavior, including (a) a study of the effect of music on speed, size, form, and character of handwriting; (b) a study of the effect of single chords on the same element of handwriting; (c) the effect of music on the drawing of lines. (5) The Müller-Lyer illusion. (6) Normal suggestibility. (7) The choice of colors. (8) Reactions indicative of affective states, including: the psychogalvanic reflex; respiration; involuntary movement (Diserens, 1926, p. 155).
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The subjects were principally university students of both sexes ranging from sophomores to graduate students. The majority possessed only an elementary knowledge of music; a few, however, were enrolled at the music conservatory. The experiments required from one to ten hours of work, depending on whether the subject participated in a few or in all the tests. The general method was to make a detailed comparison between the subject's normal reactions in the tests and the same subject's response while listening to music.

In most of the experiments a minimum of introspection was required, the subject being merely asked to state whether he was attending to the music or not and whether he considered the music pleasant or unpleasant. In the experiments on respiration, involuntary movements, and the psychogalvanic reflex, however, he was requested to direct his attention to the music, and introspective records as complete as possible were afterward secured. No information was given him concerning the purpose or the results of the experiments.

The music was furnished by a phonograph that permitted variation in volume as well as in tempo, and the following records were employed: Vocal: "Toreador's Song," "Song of India," "I'll Take You Home Again, Kathleen," "Danny Deaver," "Carry Me Back to Old Virginy"; Instrumental (marches): "Semper fidelis," "Vigoroso March," "Trumpeter's Carnival"; Instrumental (dance music): "Florida Waltz," "Rose Mousse,"

The effect of music on fatigue and endurance was measured by means of the Smedley dynamometer, using the method of continuous contractions. Ten men served as subjects. The dynamometer was adjusted to the hand and the measurements were recorded so as to maintain the same relations in subsequent tests. The subject was instructed to grip the instrument as strongly as possible as soon as the music began and to exert his maximum pressure until told to stop at the end of 60 seconds. Readings were taken every four seconds. The first trial was always without music; the second trial, with stirring music; the third, with depressive music. The records used were "Semper fidelis" and "Carry Me Back to Old Virginy."

A rest period of fifteen minutes intervened between the several trials. Introspections were recorded immediately following each test.

Diserens found that the efficiency measured by the average amount of work done was increased in 70 percent of the cases by stirring music and in 60 percent by soothing music. The index of fatigue was reduced in 50 percent of the cases by stirring music and in 40 percent by soothing music, while in several cases the course of fatigue was evidently delayed. He did not account for the reverse effects.
A Portion of the Data Obtained in Sixteen Trials

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Normal Records</th>
<th>Dynamometric Records</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Fatigue Index</td>
<td>Average Fatigue Index</td>
</tr>
<tr>
<td>1</td>
<td>35.86 .201</td>
<td>29.866 .427</td>
</tr>
<tr>
<td>2</td>
<td>30.375 .419</td>
<td>33.875 .323</td>
</tr>
<tr>
<td>3</td>
<td>28.50 .350</td>
<td>25.375 .425</td>
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<tr>
<td>4</td>
<td>20.937 .700</td>
<td>26.437 .555</td>
</tr>
<tr>
<td>5</td>
<td>29.875 .455</td>
<td>32.187 .327</td>
</tr>
<tr>
<td>6</td>
<td>29.49 .375</td>
<td>23.866 .400</td>
</tr>
<tr>
<td>7</td>
<td>24.50 .345</td>
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<tr>
<td>8</td>
<td>21.312 .787</td>
<td>25.50 .534</td>
</tr>
<tr>
<td>9</td>
<td>22.937 .477</td>
<td>24.06 .333</td>
</tr>
<tr>
<td>10</td>
<td>44.5 .369</td>
<td>47.562 .461</td>
</tr>
</tbody>
</table>

"The index of fatigue is calculated according to the formula given by Whipple (Manual of Mental and Physical Tests, Simpler Processes, p. 119)."

He concluded therefore that any of the types of music tested may increase endurance and reduce or delay the course of fatigue.

The aiming test (as described by Whipple) was used by Diserens to determine the influence of music on precision and accuracy. Nineteen subjects tried this test "under normal conditions, with fast music, and with slow music," using only the right hand. In one series the metronome was set at 60; in another, at 138. More than half the subjects complained that it was difficult to follow the metronome; evidently they substituted for it the rhythm of the music. There were no significant differences between the two speeds of the metronome with regard to their performance.
In another experiment, to determine the effect of music on the speed and accuracy of typewriting by skilled typists from copy of indifferent interest to them, a rapid stirring march and a slow soothing violin solo were used. Diserens considers the changes too slight to hazard any conclusions, "unless perhaps that agreeable music tends to increase speed in practiced typists. The slow music was pronounced most pleasant by all, while the rapid music was disliked by some and was not especially attractive to the majority. It will be noted that the average speed, as measured by number of movements made, remains practically the same for rapid music as for normal conditions, while it increases 8.8 percent for the slow music of 'Meditation.' No striking difference appears in the number of errors made under the varying conditions of the experiment but a correlation of 84 percent is found to exist between speed and number of errors in the case of fast music."

Two-minute tests on size and speed of handwriting gave the following data: "... in eight out of ten cases, there is an increase of size with fast music, in seven cases there is an increase with slow music. In certain cases there is an increase in size for both kinds of music. In general there is no significant alteration in speed with music, but inspection shows that in those cases where there was no increase in size of writing there was a considerable increase in speed. . . ."

To test the influence of music on voluntary move-
ment, the drawing of straight lines in various directions was selected as an activity approximating the movements of a painter at work and as a set of movements possessed by the average subject. The length of line was not specified, and the subject was told to select his own speed. Music, either fast or slow, almost invariably increased the length of the lines drawn. The figures on reaction time also reveal a considerable increase of speed under musical stimulus. Diserens concludes "that music of any kind increases the extent and rapidity of voluntary movements probably by reinforcing the elementary reflexes, which compose the movements."

The effect of music on suggestibility was tested on eight men and five women, by means of colored squares, using a variation of the method developed by Sidis. The apparatus consisted of 54 sheets of white paper (6 by 6 inches) upon which six one-inch paper squares of different colors were pasted at equal distances from one another. No color appeared twice on the same sheet. There were twelve sheets having one square out of position; twelve sheets on which one square was surrounded by a quarter-inch fringe of gray paper; twelve sheets on which one figure was not a square; six sheets were masked by paper the color of one of the squares on the sheet. In addition there were four-inch squares of the color of various squares throughout the series.

The subjects were told that an attempt would be made to determine suggestibility, but not what the factors
would be. The factors of suggestibility were: "abnormal position (of color elements); abnormal shape; environment, i.e., conspicuous surroundings; colored cover, i.e., a sheet of the same color as one of the squares on the following sheet; color suggested verbally before the experiment was started."

"If the square suggested either by colored cover or verbally suggested was selected, immediate suggestibility was assigned as the cause (X). If a square next to the one suggested was chosen, mediate suggestibility (Y) was said to be the cause." The factor of chance was also calculated.

The data obtained in this experiment are too complex to be quoted here. Diserens stated that they reveal considerable differences in normal results from those of Sidis,—differences to be expected in view of the absence of a fixation period and a miscellaneous group of subjects. . . . The effect of music on suggestibility is generally negative, although the difference is small in many cases. Only immediate suggestibility to verbally suggested colors and mediate suggestibility to cover increased. These are both instances of direct suggestion. The conclusion seems to be that music is in general a distracting factor, though it may slightly increase direct suggestibility.

In the experiment to determine whether there was any relation between color preference and the moods evoked by music, and the nature of this relationship, twelve subjects were asked to note their preference of color from
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28 sheets of white paper on which were mounted six one-inch squares of Bradley colors, selected at random; no shade or tint occurred twice on the same sheet. The test was then repeated with each of several musical selections. Here again he states that the results do not seem to warrant any other conclusion than that a tendency probably exists for color preference to shift toward the blue end of the spectrum when the subject is under the influence of music.

To determine the extent to which the Müller-Lyer illusion was affected by music of contrasted types, Diserens employed "an instrument by which the relative length of the lines could be altered by sliding a part of the field, like the lid of a box in and out of a framework, while the amount of the illusion in the case of each judgment could be read off a millimeter scale on the back of the instrument.

"Records of ten normal judgments, without and with music of the two types, were made, giving thirty judgments in all. The order in which the tests were given varied from subject to subject, and about five minutes intervened between tests." The results of this experiment were somewhat indefinite. On the whole, music seemed to have a tendency to reduce the amount of illusion.

The following possible explanations are offered:

(1) The musical stimuli may reinforce ocular reflexes. . . .
(2) The difference may be due to the observed fact that the subject generally responded more quickly while music was
(3) Finally, music may distract the attention of the subject, and thus cause him to neglect the features responsible for the illusory effect. This seems probable, since some subjects showing small differences in the series of judgments admitted making special efforts to concentrate on the illusion in order to avoid paying attention to the music which was unpleasant or boresome through familiarity. This may indicate why the familiar strains of the march ["Vigorous"] were less effective in producing differences of judgment than was the song ["Carry Me Back to Old Virginian"], with its numerous emotional associations.

Whether emotion as manifested by the psychogalvanic reflex can be influenced by music was the subject investigated by means of the D'Arsonval galvanometer and dry-cell batteries. These experiments lasted about two months, and the following selections were played in a room adjacent to the one in which the investigations were made: "Meditation" (violin, slow), "Rosy Cheeks" (orchestra, fast), "I'll Take You Home Again, Kathleen" (vocal, slow), "The Marseillaise" (band, fast).

Numerous tables contain the records obtained concerning each of the fourteen subjects. The original assumption in this test was in agreement with the theory of Féré, who ascribed the deflections to the lowering of bodily resistance under the influence of emotional states. Several possibilities are discussed as the basis for the deflections observed.

One fact definitely established was that "there are more changes in galvanometric deflection while the subject is
The deflections tended to be decreased in most cases, and Diserens concludes that "music in general exercises a calming influence on the listener, tending on Sidis's theory to reduce the normal amount of muscular tension and relax the whole organism."

In order to test the specific effects of some of the musical selections used in previous experiments, several pneumographic tracings were obtained from eight subjects—six men and two women—under the following conditions:

Tracings were made for 60 seconds without music; a rest of several minutes followed; the kymograph was run for another 30 seconds without music; then for 60 seconds more with music. At five-minute intervals other musical selections were introduced, as many as four to six records being employed at one sitting, from the following groups. **Slow music:** "Quanto io t'amò" (orchestral), "Florida Waltz" (orchestral), "Meditation" (violin), "Carry Me Back to Old Virginia" (vocal); **fast music:** "Infanta March" (banjo), "Dixie Medley" (banjo), "Vigoroso March" (band), "Semper fidelis" (band).

No elaborate introspective accounts were required, but the subjects were always asked to state whether the music was pleasant or unpleasant. Most of the selections were said to be agreeable. The slow music was in general more agreeable than the fast. The fast banjo pieces, however, were considered distracting by some and unpleasant by the two women and one man. "Inspection of the
records shows that music, either fast or slow, tends to make respiration more rapid,—a conclusion agreeing . . . with other investigators. . . .”

Nine subjects participated in several experiments to test the effect of music on involuntary movements of striped muscles.

The apparatus consisted of an automatograph, phonograph, and a number of records. . . . The automatograph was suspended from the ceiling of the laboratory by a strong thin cord about ten feet in length. Immediately below it on a table was laid a thick glass plate on which blackened paper was placed. The subject was seated comfortably with his back to the music which was played in an adjoining room.

The subject's arm was adjusted in the automatograph and the latter brought into a correct position over the blackened paper. Instructions were given to try to achieve an indifferent frame of mind and to avoid all movements. The record of the normal tremor during a period of from 20 to 60 seconds was then taken. After an interval of a couple of minutes a record was taken while the subject was listening to music to which he was instructed to attend.

After the experiments, introspective accounts on the affective tone were secured. Diserens gives in tabular form the direction of movement ("eccentric or concentric") and whether increased or decreased ("plus or minus"), under the influence of the various records. Eccentric movements—away from the body as a center and involving extensor muscles—generally, though not always, corresponded to pleasant affective states. Con-
centric movements—toward the body and involving flexor muscles—corresponded to unpleasant affective tone in several of the subjects.

He concludes that music of any kind tends to increase involuntary movements of striped muscles and to impart a characteristic direction to such movements, depending on the affective tone evoked.

From all these experiments, carried on for about one year, Diserens (1926, p. 205) concludes that:

1. Music tends to reduce or delay fatigue and consequently increases muscular endurance.

2. Music has no definite effect on precision or accuracy of movement, if the rhythm is not adapted to the rhythm of the work. It reduced accuracy in typewriting and handwriting, the result being shown in an increased number of errors.

3. Music speeds up such voluntary activities as typewriting and handwriting. It also accelerates respiration.

4. Music increases the extent of muscular reflexes employed in writing, drawing, etc.

5. Music reduces normal suggestibility, except in the case of direct suggestion involving color, in which case suggestibility is increased.

6. Music seems to have a tendency to produce a shift in normal preference for chromatic and achromatic impressions, the change being toward the blue end of the spectrum and the white end of the achromatic series.

7. Music has a tendency to reduce the extent of illusions by acting as a distracting factor.

8. Music influences the electrical conductivity of the human body as manifested by increased fluctuations in the psychogalvanic reflex.
Other experiments published at the same time as those of Diserens (although some of the preliminary investigations were begun much earlier) are included in the book edited by Schoen (1927). These experiments are concerned for the most part with the effects of complete musical selections, in contrast to the earlier use of single-chord stimuli.

One of the papers in this text (p. 184) refers to a study carried out by Hyde and Scalapino in 1918, in which they employed recordings of Tschaikowsky's "Symphonie pathétique," characterized by slow minor movements (orchestral), the Toreador's description of the bullfight from "Carmen" (vocal), and "The National Emblem," a march (band). In a few special cases a lullaby, played on the violin, was used to test the effects upon the cardiovascular system.

The group tested consisted of fifteen men and women — some known to be fond of music, some Indian students, some persons indifferent or not sensitive to music, some neurasthenics. From one to five minutes before the music began and from one to fifteen minutes after it had ceased, records were taken of the pulse rate, systolic, diastolic, and pulse pressures, relative velocity of the blood flow, and electrocardiograms that measured the action current or electromotive force of the ventricular muscle contractions.

"The electro-motor changes in the contraction of the
cardiac muscles were obtained with an Einthoven string galvanometer . . . set for a film speed of 2.5 centimetres per second, and the time marker deflection per one millivolt.” Three photographs were taken showing the effect of each musical record on each listener. A Tycos sphygmomanometer, controlled by an Erlanger type of apparatus, was used to get pulse rate and blood pressure. The systolic pressure was read at the onset of the first phase, and the diastolic at the beginning of the fourth in every case. For control data the students’ records were taken without the influence of music, taking into account the fact that cardiovascular changes vary somewhat during the day even under normal conditions.

Three tests were made for each listener, using the Tschaikowsky music. For the purpose of testing the effect of the symphony on a convalescent person, responses were secured from a hysterical patient. It was apparent that the minor tones affected and distressed her. A music instructor, fatigued after a day’s teaching, also showed a reaction of aversion.

Hyde states:

In both of the last two types of individuals there was, after hearing the music, a marked rise of all the cardio-vascular functions excepting the pulse pressure and E.M.F. of the heart muscle. This was followed ten minutes later by a remarkable reversed action of the cardio-vascular activities, which in the case of the convalescent was a change to less than what they were before the symphony had been heard.
She concludes that “as a result of these experiments it is safe to say that music of the character of the symphony is not to be recommended for individuals who are fatigued, depressed, or ill. It might be employed to subdue hilarity in individuals or masses of people.”

The minor tones of the symphony as a rule had a depressing effect on the remainder of the group, consisting of persons sensitive to music. In the students who were neither fond of music nor sensitive to it, the results obtained before and after listening to the music were practically alike.

The “Toreador” song did not have the same physiological or psychological effect on all the listeners who were fond of music. All the reactions except the diastolic blood pressure were augmented in those who enjoyed the song very much, but were lowered somewhat in those who did not enjoy it. The Indian student remarked that there was a challenge in the spirit of the song that annoyed him. The records showed no change in his reactions. The instructor’s record indicated that familiarity with and repetition of music that was indifferent to her had little effect on the cardiovascular system. This song disturbed a listener when she was in poor health, but a month later she enjoyed the song, and the reactions were then reversed. The cardiograms and records of the reactions of persons not sensitive to music showed that the “Toreador” song exerted no influence on them. The author states that “it is not known from these experi-
ments whether it was the spirit inherent in the song or the musical and vocal tones that produced the greater effect.”

The “National Emblem” band music was stimulating and proved enjoyable to all sensitive listeners except the instructor. Increased activity was especially noted in the systolic and pulse pressures and relative velocity of the blood flow. The music “had a bracing effect and removed fatigue. On two of the non-sensitive listeners . . . this march produced a slight and increased reaction. But neither the stolid Indian girl nor the man who could not keep step seemed to be affected by even this class of music or instruments.”

As a surprise selection, an Indian war song was whooped and sung by the composer of the song to drum accompaniment. Each of the listeners was differently affected. “On a male music student much interested in the composition of sounds it first produced a great rise in systolic and pulse pressure, but a fall in all of the other reactions for about fifteen minutes’ duration. . . . But in a convalescent, the tremendous effect was at once a marked decrease, especially of the systolic pressure . . . and velocity of the blood flow that lasted more than thirteen minutes. . . . The effect on her was more like a shock.” A similar effect was observed in a woman fond of music who had never heard such a selection, except that there was a remarkable increase in the electromotive force of the cardiac muscles. An Indian man, fond of music and
familiar with Indian songs, registered surprise and pleas-
ure. The records taken during the time when he was
listening to the performance showed an increase in pulse
rate and diastolic blood pressure and a slight increase in
electromotive force. The nonsensitive Indian listeners
also reacted psychologically and physiologically to the
performance, though not all in the same degree. Hyde
believes that the effect of this wild war song may be lik-
ened to a reflex shock produced by strong stimuli.

The musical tones proved restful and beneficial to a
woman patient suffering from nutritional disturbances
and cardiac involvement, and Hyde concludes that “it
is safe to recommend the lullaby as a sedative influence
for individuals who are sensitive to musical tones.”

She believes that, in spite of the differences in results,
it has been demonstrated . . . that certain selections of
music and most likely certain musical instruments and quali-
ties of the vocal sounds exert a far-reaching influence upon
the cardio-vascular system and very likely upon other func-
tions of the body. It is probable that the employment of cer-
tain selections of music will prove a valuable aid in the treat-
ment of nervous disorders. . . .

We may conclude from the results of this investigation
that most people are unfavourably affected psychologically
and physiologically by music that is characterized by tragic
mournful tones, and favorably affected by gay rhythmical
rich toned harmonic melodies. Individual differences in na-
tive endowment and training are accompanied by individual
differences in physiological reactions to certain musical com-
positions.
Treves (1927), a physician, noted that with the exception of Hyde and Scalapino experimenters have based their conclusions upon their impressions of the psychological appeal of music rather than upon its effect on the various physiological processes. He therefore conducted a series of observations to determine the effect of music upon the pulse rate, the respiratory rate, and the blood pressure of ward patients in the New York Memorial Hospital. The number of subjects varied slightly on different days, eight to ten males and twelve to fourteen females comprising the experimental group. No ages are given. All of them had cancer, hence, “in the majority of cases there was an inherent depression.”

The experiments were carried out under nearly constant conditions and by the same persons. The same hour each day was selected (between three and four in the afternoon). Some 280 observations were recorded, 89 being made when four programs were confined to entirely classical selections. Six programs of mixed selections were given, and a series of 136 observations were made; during seven programs of popular music 155 observations were recorded. The music was furnished by an Ampico reproducing piano; titles of selections are not given.

Treves found that

Programs of entirely classical selections caused the less noticeable variations in pulse rate. . . . Popular airs and tuneful melodies had the tendency to accelerate the pulse . . .
Deviations from the average result were pronounced in the males. . . . For the most part the pulse was quickened by familiar and popular melodies and in instances by classical numbers [in German or Italian patients], but not to so marked a degree. A decrease in pulse rate was never marked. There was no change in the respiratory rate. The general effect upon the blood pressure was to lower it, but over fifty per cent of the patients showed no change. These observations were made using only a mixed program. There was no stimulus for a greater intake of food nor did the music have any effect in altering the medication of these patients.

The investigator concludes that “from a purely psychologic and possibly a psychotherapeutic standpoint, these patients were benefited,” but that “person for person, if these cases were pure medical or surgical types the results would most probably be different.” He calls attention to the fact that in most instances where music has been employed as a therapeutic agent the favorable effects were observed in individuals who normally take pleasure in listening to music.

A somewhat later study, also concerned with physiological changes, was conducted by Washco (1933). He secured in addition some data on mental imagery. One of the main purposes of this study was to ascertain whether musical sensitivity and training bear any relation to these physiological changes. The latter problem was investigated by means of the Seashore rhythm and Kwalwasser melodic and harmonic sensitivity tests.

Sixty-one senior high school students served as sub-
PHYSIOLOGICAL EFFECTS

jects. There were 34 boys and 27 girls between the ages of 14 and 19 years. The following records were used: “Invitation to the Waltz” (von Weber), “Serenade” from Madame Butterfly (Puccini), Intermezzo, “Cavalleria rusticana” (Mascagni), “Hungarian Rhapsody No. 2” (Liszt), “Rhapsody in Blue” (Gershwin), Overture, “Carnival” (Dvořák), Overture, “Der Freischütz” (von Weber), “Stars and Stripes” (Sousa).

Pulse rate and blood pressure readings were taken, after which a phonograph record was played and the subject was asked to suggest a title and underline on a list two words that described the music. The record was then repeated, and the pulse rate and blood pressure were noted again during the last minute of playing. The students were also asked to write a story that described the music and to indicate whether rhythm, melody, or harmony was most significant in the mental picture evoked by the music.5

Washco has included a number of tables containing the data for each subject and for the group as a whole, giving changes in blood pressure, pulse rate, sensitivity correlation, and other factors studied. Appended to each

5 From an analysis of descriptive terms used by 150 students, half of whom listened to the Intermezzo from “Cavalleria Rusticana” and half to “Hungarian Rhapsody No. 2,” Washco selected the following words to be marked by the students: peaceful, contented, sad, soothing, happy, exciting, spirited, gay, restless, awesome, uncanny, oppressive, religious, melancholy, love, and pleasant. He found that there was a “tendency of constancy of mental imagery.” Selections showing high emotional or feeling states were most enjoyed, and the greater the emotional effect, the greater the enjoyment and physiological reaction.
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table are the investigator's summary of results. For example, he states that with the record of "Invitation to the Waltz" (p. 71):

[On pulse rate] the total decrease for the group was 216 points, the total increase was 12 points. The average decrease was 7.2 points (N = 30). The average increase .4 points (N = 30). It may be seen at once that this composition functions definitely, that is, it lowers the pulse rate on an average of 6.8 points.

[On blood pressure] the total increase for the group was 37 points. The total decrease for the group was 200 points. The average increase for the group was 1.2 points. The average decrease for the group was 6.6 points. The average decrease or lowering of the blood pressure is 5.4 points. This music definitely lowers the Blood-Pressure.

Other tables on this selection give the following data:

The correlation of Pulse Rate Change and Sensitivity is insignificant (r = .13). There is no correlation between Blood-Pressure Change and Sensitivity (r = -.06). . . . There is no significant correlation between [boys' or girls'] pulse Rate Change or Blood-Pressure Changes and Sensitivity. . . . There is a slight correlation between Pulse Rate Change and Age. There is no correlation between Blood Pressure Change and Age.

In a comparison of selected students it was noted that the response in those who were musically trained was slightly stronger than in those who were not so trained. The average change for the former was -9.5 (pulse) and
-7.0 (blood pressure), as against -7.5 and -4.2, respectively, for the untrained students.

With respect to the stories submitted with this record, Washco writes (p. 87): "The words selected typify the feeling states. . . . The dominating element suggesting the story to the listener in the majority of cases was rhythms, rather than melody. In emotional and descriptive content these stories correspond to the original and furthermore they accompany the particular increase or decrease of pulse and blood-pressure of the individual writer."

Similar detailed tables and notations are given for the other records, followed by conclusions and personal reflections by the investigator. There are in addition sixteen general summary tables.

From these data Washco deduces certain general conclusions, which he amplifies with respect to each record used, the tenor of which seems to be that music properly prescribed will assist in lowering (or raising) the pulse rate and the blood pressure; and that music may have therapeutic uses, as well as the possibility of application to clinical medicine.

Miles and Tilly (1935), in an experiment to test physiological reactions to music, used the type of apparatus designed by Vincent and Thompson (a water manometer plus an arm band designed to transmit changes of arterial pressure over long periods without causing venous ob-
struction) for blood pressure measurements, tracing the respiratory changes on the same tambour, while music was being played. Some subjects were hypnotized beforehand so as to eliminate distracting influences, and to "gain a true report of subjective sensations." This method they believe justified by the results.

"In controlled experiments with the same subjects listening to the same music in both the conscious and hypnotic states, it was found that the recorded results were qualitatively exactly the same, differing only in the respect that the excursions were greater with subjects in hypnosis."

In the case of respiration, both the direct and indirect stimuli had definite effects, provided the subject was interested in the music. Change in tempo was the chief cause of respiratory change. Change in blood pressure depended largely on individual reaction to the idea expressed by the composer and to the tempo.

If an effort was being made by the listener to understand or to appreciate music unfamiliar to him, there was a steady rise in blood pressure and respiratory rate.

The authors conclude that the data are too fragmentary to accept the results as statistically proved. They "regard them more as being very strongly indicative."

Schönauer (1935) has reported a series of experiments designed to test the effects of music, which he believes shows "that music is capable of producing several kinds of reaction, sphygmographic, pneumographic, and psychic,
all of which can be individualized, distinguished and re-
produced, each one varying in relation to the musical,
individual and surrounding factors."

A recent experiment with blood pressure readings was
conducted by Sunderman (1946), in an effort to de-
terminethephysiologicdifferencesbetweenmusicians
and nonmusicians. From 594 women who had done con-
siderable work in music, 248 were chosen for the study.
Another 247 who had not studied music were chosen
from 12,000 university students, to serve as controls. The
age, weight, height, nationality, and educational inter-
estsofthetwogroupswerematchedasnearlyaspossible.
Sunderman observed that while mean diastolic and sys-
tolicreadingswerelowerforthemusiciansthanthefor
nonmusicians, the differences were not statistically signifi-
cant. He concludes:

It may be that the experiment might have proved fruitful if
musicians could have had blood-pressure readings made di-
rectly before and after musical performance. . . . It may be
thatinthenormallivingprocessesthemusicianisquitypi-
cal in the trait under consideration. The tendency toward
lowerreadingsinthemeasurementofthemusicians'blood-
pressure may be indicative of an exhausted or more relaxed
condition in the normal living situation.

Palmer and Zerba (1945) made an intensive study of
the effects of music in cerebral palsy. They observed only
one subject, but cite several instances from the litera-
ture in which the use of music has been attempted for
spastic patients, one or two of these relating to athetosis. The subject under study was a highly intelligent man of 21 who presented symptoms of spastic paralysis and tension athetosis so severe that he could not dress himself, and his speech was unintelligible. There were no overt vermiform movements. He was first observed in 1938, and the authors report that "he now has intelligible speech, adequate locomotion, writes crude longhand and earns his own living. . . . The subject was extremely fond of music and reacted quite emotionally to music in general."

During the experiments the patient’s arm was strapped to a school desk to avoid involuntary movements. His index finger was placed on a tambour and the finger movements were recorded on a kymograph. He could not see the recording styli or the experimenters. "Two very distinct groups of sound stimuli are represented in this series of experiments: (1) a more or less heterogeneous group, and (2) a homogeneous group consisting of very sharp explosive isolated sound surges, which will be described later under the general title 'Martele Series. . . .'"

Numerous data obtained in the experiments are given in this article. The authors state:

It was possible to increase and control the severity, rate and stability of this tremor [of the index finger] by means of sound (and visual) stimuli. When such an increase had occurred, it was discovered that sudden cessation of the stimuli (rhythmic, arrhythmic, musical, not musical, etc.) produced
remissions of the tremor for considerable lengths of time. Instantaneously loud sounds, produced as described above, gave the best results. Remission following the experimental series lasted for six weeks.

Others are said to be working with the electroencephalogram, and there are indications that the scope of future experiments on physiological effects will be widened to develop more comprehensive data on methods and results. Commenting on the report by the Davises of Boston that musical sounds are capable of influencing Berger rhythm, Altshuler (1944) states that “it will be possible, in the future, not only to register the effect of structural elements and simple compounds of music upon Berger rhythm, but even of symphonies.”

Chemical changes as well as physical ones are said to take place, as noted by Underwood (1946) in his brief summary of the experimental work on the human response to music. Although no actual tests on human beings are as yet possible, in Malisoff’s researches on the chemistry of disease he found that musical sounds broke up or dissolved cholesterol, a substance present in gallstones and in certain types of sclerosed blood vessels. Underwood also states that the establishment of committees among professional music groups will encourage greater interest in further research.

To date, however, investigations have been sporadic and unrelated. Burris-Meyer and Cardinell (1946), two men who have been identified from the beginning with
the objective study of the use of music, the mechanics of acoustics, and the optimum method of programing, after analyzing the published material (on music in hospitals) conclude that:

If music contributes to any change in the person who hears it, it is because the music, an auditory stimulus, induces a reaction in the hearer. So far as the writers have been able to determine there has been little use made of the knowledge already available in the field of inducing physiological and psychological reactions by means of auditory stimuli.

They call attention, in addition to the experimental work already cited herein, to special studies then being conducted at the Harvard Fatigue Laboratory, which "indicate the possibility that certain kinds of music for certain people can sustain attention to prolonged psychomotor performance above and beyond the effects of drugs."

These writers suggest that future research make greater use of the techniques developed in the physical sciences.

Given a known relationship between a sound and the physiological reaction it stimulates, it is first necessary to define the sound precisely. Known auditory stimuli must be translated into musical idiom. The techniques for doing this are precise enough for the purpose. The music must at least be definable in terms of intensity and dynamic range, decay curve, rhythm, plus the other elements which are recorded in musical notation. Next, the conditions under which the music is applied to the patient must be controlled, and within
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any single experiment, uniform. So far as the music is concerned this involves acoustic conditions which will not change the characteristics of the prescribed stimulus in any respect. It is obvious that in interpreting a stimulus in musical terms and getting it to the patient, under controlled conditions, there is work for the musician and the physicist combining their efforts to achieve the result called for by the psychiatrist.

The patient selected for the study must have a known degree of a known ailment, and there must be two or more controls against which to check progress. . . . Studies of music in industry have produced reasonably reliable techniques for production and maintenance of predetermined degrees of reaction.

The multitude of techniques for measuring how a person feels or what his subconscious reaction may be, at a level below that which is accompanied by an observed physiological reaction, offers means of studying what the stimulus does to the subject. These techniques involve psychogalvanic measurements, electro-cardiographs, electro-encephalograms, etc. Insofar as such techniques have been employed in the study of music intended to facilitate convalescence or alleviate ills, they have not been accompanied by an appropriate understanding, definition, or control of the stimulus. . . .

There are many imponderables which are at the present time difficult of evaluation and should therefore probably be initially excluded if we are to discover the nature of the musical stimulus and the manner of its application to the specific ailment. A few of these are: the relative effects of the artist's personality versus the music produced; the importance of the patients' participation in making of music; and patients' study of music.
Additional experiments referred to in *The Effects of Music* (Schoen, 1927) have been said to justify the use of music as a therapeutic agent. They deal with types of listeners, the sources and nature of the affective reactions to instrumental music, the mood effects of music, the immediate and long-time effects of classical and popular phonograph selections, and the effectiveness of musical stimuli in producing cardiovascular changes. It is to be noted, however, that musical theory rather than musical therapy seems to have motivated some of the studies.

One series of experiments in this volume that comes closer to the problem under consideration is that by Washburn and Dickinson (p. 121). The object of their study was to note the comparative frequency with which rhythm, melody, design, harmony, and tone color are mentioned as contributing to the enjoyment of instrumental music, to observe the relation of pleasantness to the exciting and quieting effects of music, introspectively reported, and to classify the emotions produced by instrumental music.
The subjects were female college students, varying in number from 40 to 55, ranging from some who were distinctly not gifted musically to a few who had considerable musical talent. The observations lasted throughout the greater part of two semesters.

With the exception of Handel’s “Messiah,” only recorded instrumental music was used. The compositions were distributed as follows: Handel, 8; Bach, 30; Haydn, 7; Mozart, 7; Beethoven, 19; Couperin, Rameau, Scarlatti, 1 each; Schubert, 2; Schumann, 25; Chopin, 13; Mendelssohn, 5; Weber, 2; Berlioz, 1; Liszt, 6; Wagner, 20. The subjects were asked to note what “phases” (or “aspects”) of the music gave them pleasure while listening to each recording, and for this purpose they used a coded slip containing the number and letter of the question, not the question itself. The number of times that a given source was mentioned was recorded—that is, melody 5,324, rhythm 4,151, harmony 2,935, design 2,814, and tone color 1,558.

The investigators infer that while the results probably do not indicate the relative amounts that these elements actually contributed to pleasure, they do show their relative claim on attention. Melody was the most noticeable source of pleasure with regard to all the composers except Handel, Brahms, and Debussy, for whom it stood second. Rhythm was first in importance only for Brahms. It stood second for Haydn, Beethoven, Schumann, Chopin, and Mendelssohn; third in importance for Bach,
Mozart, Wagner, Liszt, MacDowell, and Debussy; fourth in importance for Handel. They noted that compositions that are either markedly exciting or markedly quieting are more agreeable than compositions that are neither. They also observed that there is a tendency for the pleasantness to be greater, the greater the number of sources to which that pleasantness is referred.

Every descriptive word that indicated general emotional reactions was considered. Washburn and Dickinson define the term "emotion" as used in this study as covering "any sort of affective reaction except simple pleasantness-unpleasantness, excitement, or quieting."

By far the most frequently mentioned emotional states were happiness, gaiety, calm, and sadness. These terms, or their equivalents, occur from twenty to two hundred times as often as any others. . . . All of the emotions occasioned by instrumental music belong to the type of affective reactions lacking a definite object; thus they stand closer to moods than to true emotions. . . . The emotions accompanying instrumental music may be classed under the following heads: Active pleasant emotions, involving (a) diffuse activity, (b) diffuse superficial activity, (c) concentrated forward activity; active unpleasant emotions, involving some conflict or inhibition; passive pleasant emotions; passive unpleasant emotions (a) wholly passive, (b) with some element of activity; emotions involving slight fear.

An investigation by Schoen and Gatewood (Schoen, 1927, p. 131) on the effects of music on moods was prompted by the results obtained from a study of more
than 20,000 mood-change charts on which that number of persons in various parts of the country had reported the effects produced upon their moods by 290 phonograph recordings of vocal and instrumental music. Only one test was made with each group. An analysis of the data indicated that in general not only does a musical composition produce a change in the existing affective state of the listener but also that its effect upon a large majority is strikingly uniform. (See also Olson, 1947.)

In the resulting study the investigators sought to learn, in addition, whether the induced mood were also enjoyed and to what degree enjoyment depended upon the type of mood induced, familiarity with the selection, and the listener's opinion of the quality of the selection. Some ten questions relating to these problems were considered in the one experiment.

Diverse types of music were used (all instrumental), representing nine descriptive categories, which were classified as either joyful or serious. The observers consisted of seventeen men and women, some of whom were well-trained musically. At five different sessions the observers were asked to give a free and spontaneous report instead of checking a previously arranged list. The results indicated “that the large variety of selections used in this investigation produced not only a change of mood in practically all the listeners, but also that the moods induced by each selection, or the same class of selections . . . are strikingly similar in type.”
Extraneous factors, such as the grating of a record, dragging of the tempo, and so forth, modified the reactions, so that the resulting mood was not due solely to the quality of the music itself.

A second investigation was undertaken to test the consistency of musical effect (as reported by the listeners). Data were obtained under the same circumstances on two separate occasions from 32 college women who heard 10 selections (5 instrumental and 5 vocal), as follows: “Les Oiseaux dans la charmille,” “Anvil Chorus,” “Stars and Stripes Forever,” “Love’s Old Sweet Song,” “To a Wild Rose,” “He Shall Feed His Flock,” “At the Brook,” “Blue Danube,” “Ave Maria,” “Menuetto all’anti’co.”

“The number of observers who recorded at the second hearing of a selection the same feeling which they reported at the first hearing was surprisingly large,” the lowest showing 45 percent agreement, the highest 91 percent. However, the three records that induced the most consistent reactions were in the nature of “stirring music.”

The investigators noted that “on the basis of this group of musical selections a feeling of rest is the most frequent result. This seems to hold generally true of arm-chair music, which makes up the library of a vast proportion of music-loving persons.”

In studying the problems related to the mood effects, Schoen and Gatewood also attempted to ascertain the emotional qualities that are most frequently aroused by music.
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Eleven emotional effects most often reported by listeners to a very large number of musical selections as given in the accompanying table were used in a statistical analysis to determine the relative rank and consistency.

Relative Frequency of Appearance of Various Emotional Effects

<table>
<thead>
<tr>
<th>Emotional Quality</th>
<th>Number of Appearances</th>
<th>Relative Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rest</td>
<td>698</td>
<td>.39</td>
</tr>
<tr>
<td>Sadness</td>
<td>798</td>
<td>.45</td>
</tr>
<tr>
<td>Joy</td>
<td>728</td>
<td>.41</td>
</tr>
<tr>
<td>Love</td>
<td>628</td>
<td>.35</td>
</tr>
<tr>
<td>Longing</td>
<td>535</td>
<td>.30</td>
</tr>
<tr>
<td>Amusement</td>
<td>229</td>
<td>.12</td>
</tr>
<tr>
<td>Dignity</td>
<td>349</td>
<td>.20</td>
</tr>
<tr>
<td>Stirring</td>
<td>501</td>
<td>.28</td>
</tr>
<tr>
<td>Reverence</td>
<td>243</td>
<td>.14</td>
</tr>
<tr>
<td>Disgust</td>
<td>37</td>
<td>.02</td>
</tr>
<tr>
<td>Irritation</td>
<td>160</td>
<td>.08</td>
</tr>
</tbody>
</table>

*Schoen (1927, p. 153).

From these data it was also determined that “Generally speaking, emotions and moods are more often reported as the result of vocal music than of instrumental music. A greater consistency of effect upon several hearers is found with vocal music than with instrumental. However, in the arousal of certain effects, namely, dignity, rest and joy, instrumental music as often or more frequently is the appropriate stimulus. . . . However, instrumental music may arouse quite as definite and quite as intense emotional responses as vocal music.”

The relation of the listener’s mood to the kind of mu-
sic he wished to hear and to the effect of the given music upon him was also studied. It was noted that more people expressed a wish for music dynamically similar to the existing mood than for music of the opposite effect; that music itself does arouse specific responses and that the elements of the music are the most dominant factors in the effects produced; that the more intense moods arouse a desire, more or less marked, in a definite direction—the exhilarating for continuation of that type of mood, and the depressing for a change to the opposite mood.

According to these investigators, "the element of enjoyment is probably the one factor of greatest significance in any investigation relative to musical effects," since that is the only standard at present available for judging intensity of emotion.

The non-musical . . . enjoys music but rarely, and then but slightly, while the very musical person, whose taste is discriminating, and into whose musical judgment there enter many complex and complicating factors, particularly those relating to interpretation, likewise meets rarely with enjoyment, but when present it is intense. . . . The somewhat musical, on the other hand, whose attitude towards music is uncritical, but who are nevertheless attracted to music, find great enjoyment most often.

Hevner (1936, 1937, 1939) investigated this problem from a different approach. By varying one element in a composition (for example, rhythm) and having the listeners report their reactions, she found that
The elements studied and their associated meanings as determined by [the method described by Hevner] are as follows:

(a) The major mode is happy, merry, graceful, and playful; the minor mode is sad, dreamy and sentimental; and such qualities as excitement, vigor, dignity, serenity, etc. are not determined by either mode. (b) Firm rhythms are vigorous and dignified; flowing rhythms are happy, graceful, dreamy, and tender; and neither is particularly useful in determining such characteristics as excitement, satisfaction, and serenity. (c) Complex, dissonant harmonies are exciting, agitating, vigorous, and inclined toward sadness; simple consonant harmonies are happy, graceful, serene, and lyrical. (d) Differences in expressiveness caused by the rising or falling of the melodic line are not clear-cut, distinct, or constant. There are tendencies toward the expression of both exhilaration and serenity by the descending melodies, and toward dignity and solemnity by the ascending (1936, p. 268).

She warns, however, that these findings merely reflect the techniques of the works studied and that the findings are in the nature of broad generalizations and averages. The affective tone is dependent on the composition as a whole, rather than on any of its complex variables.

In an attempt to learn the factors of a musical phrase that have emotional significance, Rigg (1939, 1940) presented five musical phrases, each in five different registers, to be judged by 84 college students. Phrase I was classed as sad, Phrase II joyful; Phrase III moderately sad; and Phrases IV and V happy in general, but less joyful than Phrase II.
Shifts of as much as an octave upward always made the phrase happier or less sorrowful in tone. Shifts of approximately half an octave, that is, up or down to the dominant, in general bore out the theory that the higher register is the happier, although the results were not entirely consistent. Shifts down one step and up one-half step produced in the main only inconsequential changes in the data, and the writer feels that no real evidence was found for the view that different tonalities possess distinctive characters.

Schoen (1942, p. 166; 1945, p. 70), in evaluating these and other experiments included in his book on the effects of music, considers that they have demonstrated that there is a close connection between feeling and music. The evidence for this statement he finds in the following tendencies:

1. When people are instructed to listen to a musical composition and report what it did to them, their accounts begin most often with the phrases: "It made me feel," "I felt like," "it gave me the feeling," and similar ones. . . .

2. The results obtained from experimental researches on the physiological effects produced by sound stimulation . . . show that the effects are all of the nature of those bodily processes that are typical of strong emotion, namely, change of heartbeat, pulse, blood pressure, deeper and faster breathing, and increased muscular tension. . . .

3. Even in experiments in which the subjects are asked to find a pictorial, dramatic, or narrative content of a musical composition, the reports show that, whereas the listeners vary enormously in their accounts of what the music is alleged to express, all the descriptions are of highly emotional situations.
He notes also that music as therapy has proved to be most effective in the treatment of cases which are the result of emotional disturbances.

The answer to the question, What is it that music does to emotion that accounts for its therapeutic effect? he says lies in the fact that, while music does arouse emotions, it must also do something that transforms that emotion to one of peace and repose. The feeling stimulated by music is not a specific emotion, but a general feeling state, or mood. "Musical emotion is thus a state of repose in tension." While other stimuli arouse negative or positive moods, the mood is always positive in music. Which is what raises it to the sphere of the aesthetic and makes music the universal healer.

Diserens and Fine published in 1939 a review of the material relating to the psychology of music. They combined in this text a résumé of the work reported in the earlier volume by Diserens (1926) and the contemporary work, including an extensive bibliography on the various phases discussed.¹

Referring to the effects of music on mood, they state:

A complete knowledge of the conditions under which music is employed is all that is necessary to make the production of a desirable emotion, with its attendant physiological changes,

¹ The book discusses the origin of music; animal auditors; music in mythology and folklore; the music of magic and sorcery; music and religion; music and medicine; music, melancholy, and ecstasy; music and daily tasks; early experiments on the effects of music; experiments pertaining to the influence of music on behavior; contemporary experimental work on the psychology of music.
possible to the experimenter, and this is the final aim of the musical therapist. Thomas Edison's "mood tests" worked out by Dr. Bingham and his assistants constitute one of the most important steps toward a practical and fruitful musical therapeutics. We believe that the compilation of a sufficient number of mood-change charts taken from all kinds of listeners to the Edison phonograph would result in a body of statistics indicating the probability of the appearance of any specific kind of emotion, in connection with various musical selections. If the conditions under which the tests are given could be standardized and repeated in cases of therapeutic application the certainty of the effect would be increased. The physician who applies music as a therapeutic agent must moreover be acquainted with the patient's manner of life, knowledge, character, temperament, passions, habits, musical training, and musical aptitudes in order to predict and control response to music with any degree of success. In the absence of such control, undesirable physiological changes may be induced (p. 171) . . .

Hampton (1945) set up an experiment to investigate the following problems from a psychological point of view:

To what extent can the emotional expressions which a composer conveys with his music be identified by the listener? What emotional experiences does a composer arouse in his listeners? How are such emotional experiences related to the total enjoyment of the music? What bearing has familiarity with musical compositions on the responses made to the first three questions?

Fifty-eight subjects were selected from the student body and college personnel, thirty-six of whom had had
some musical training. Forty-six of the students were among those taking general psychology courses.

Ten phonograph recordings were used, chosen on the basis of the intent on the part of the composers to express one or more dominant and several subordinate emotions, as stated by the composers and as judged by music critics. These were:

*Merry Wives of Windsor*, part 2, Nicola; *Symphony No. 3*, E flat, 2d movement, part 5, Beethoven; *Prince Igor, Polovetski Dance*, Borodin; *Symphony No. 1*, F major, 4th movement, conclusion, Shostakovich; *Til Eulenspiegel*, part 3, Strauss; *Der Freischütz Overture*, part 2, Weber; *Symphony No. 7*, C major, 2d movement, conclusion, Schubert; *Fantastic Symphony No. 1*, C major, part 4, *March to the Scaffold*, Berlioz; *Symphony No. 5*, C major, part 2, completion, Beethoven; *Symphony No. 4*, F minor, 4th movement, conclusion, Tschaikovsky.

Each listener was required to answer the following questions:

Do you sing or play any musical instruments? Can you identify the musical selection played? Have you heard the selection before? Can you identify the emotional expressions which the composer is trying to convey with his music? What emotional experiences does the selection give you, and in what way are these experiences related to the enjoyment of the selection?

They were also asked to indicate their reactions to the records by the use of thirty previously defined words (whose connotations had been explained to them).
Hampton presents several tables embodying the results of the experiment, from which he draws the following conclusions:

Percentage of agreement of respondents with the emotional expressions intended in a musical composition is proportional with the program nature of a musical composition. . . . There is little if any relationship between familiarity with a musical composition and the ease with which the emotional expressions which the composer intended to convey can be identified. Mental attitudes . . . are easier to identify than purely emotional expressions. . . . The emotional expressions characterized by unpleasant feeling tone . . . are easier to identify than the emotional expressions characterized by pleasant feeling tone. Emotional expressions characterized by either an unpleasant or pleasant feeling tone are easier to identify than emotional expressions where the feeling tone is subdued and cannot be said to be either pleasant or unpleasant. . . . Respondents do not as a rule analyze their emotional experiences derived from music in terms of specific emotional content, but rather in terms of a general feeling tone of pleasure. . . . Specific emotional experiences derived from music are culled from the respondent's associational background.

The foregoing experiments emphasize the fact that response to music is not determined by the musical stimulus alone, but depends also on the previous conditioning of the listener. Various categories have been suggested for classifying "reaction-types," for example, the "intra-subjective," "associative," "objective," and "character" types of Myers (Schoen, 1927, p. 10), or the "sensorial,"
perceptual,” “imaginal,” “compound,” and “reciprocal” types of Ortmann (Schoen, 1927, p. 38 and p. 244).

One individualized form of response that has received considerable attention in theoretical and experimental literature is that of “colored hearing.” Studies on colored hearing have been reported by Anschütz (1927), Vernon (1930), Ortmann (1933), Kravkov (1936), Karwoski and Odbert (1938), Omwake (1940), Odbert, Karwoski, and Eckerson (1942), Karwoski, Odbert, and Osgood (1942), and Engstrom (1946).

Chromesthesia and similar phenomena may be significant factors in experiments designed for therapeutic purposes, especially if it can be demonstrated that synesthesia is associated with some form of instability (see Diserens, 1926, p. 71). However, Seashore (1947) has suggested that the entire subject be re-examined from a critical point of view. He writes:

*Synesthesia* is the experience of an associated sensation when a particular sense is stimulated. This may occur in any combination of the senses. *Chromesthesia* is the experience of color when any sense organ other than the eye is stimulated. Certain persons invariably see a color when they hear a particular tone. The color may vary with pitch, intensity, or timbre, but it is fairly constant for a fair sample of representative tones. The literature on the subject is unreliable because the earlier experiments were made without critical psychological control. An excellent historical treatment of the subject has just been published [Engstrom, 1946].

2 Compare the use of “Auroratone” films and music, as described by Rubin and Katz (1946), mentioned on p. 129.
Colored hearing varies in degree and stability, but I venture to predict that critical repetition of the historical experiments on this subject will show that true colored hearing is limited to less than one per cent of the population and yet is a concrete and striking phenomenon. It is usually associated with high-strung temperament and sometimes with hysteria [Seashore, p. 360].

Among the few experiments conducted under hospital conditions up to that time is that of Altshuler and Shebesta (1941). Their object was to select a method that might be used alone or in conjunction with hydrotherapy as an aid in quieting disturbed mental patients, some of whom were prone to consider the treatment punitive. For the psychotic patient, as for others, certain tunes and words may bring back familiar associations, and it was thought that revival of basic realities might aid in making him more accessible.

Four chronically disturbed schizophrenic women (English-speaking) who had been unsuccessfully treated with hydrotherapy alone, were observed while under musical treatment combined with hydrotherapy. Head movements and vocal productions ("output") under both conditions were compared over a six-week period, five days a week, two or three hours each day. A female violinist played behind a screen, which also shut off other patients. A similar experiment was conducted on a group of four quieter female schizophrenics (of Italian parentage), for twenty days.

During the experiments some patients (even those
Mood Effects

previously very antagonistic) expressed appreciation of the music, and in general the whole atmosphere of the hydrotherapy room was changed for the better.

Average Verbal Output (Calculated per 30 Minutes for Entire Time of Observations) on Patients Receiving Cold Wet Sheet Packs

1. Average output (per 30 min.) before treatment 53
2. Average output per 30 min. during pack (no music) 56
3. Average output (per 30 min.) during pack (with music) 58
4. After effect of No. 3 (observations begun 15 minutes after cessation of music) 31
5. Average output during dry pack (per 30 minutes) 42
6. Average output during dry pack (with music) 57
7. After effect of No. 6 29

Average Verbal Output (Calculated per 30 Minutes for Entire Time of Observations) of Patients Receiving Continuous Baths

1. Average output (per 30 min.) before treatment 33
2. Average output (per 30 min.) during treatment 58
3. Average output (per 30 min.) during treatment (with music) 57
4. After effects of No. 3 begun 15 minutes after cessation of music 36
5. Average output during treatment without water 58
6. Average output during treatment without water in tub (with music) 41
7. After affect of No. 6 (observations begun 15 minutes after music had ceased) 27

Source: Altshuler and Shebesta (1941).
The authors state that observations on a larger number of patients will have to be made before definite conclusions can be drawn. However, they believe that music seems useful in decreasing output of disturbed and inaccessible mental patients and tends to prevent the feeling that hydrotherapy is a punitive measure. Moreover, music can be used to treat large groups simultaneously. Familiar tunes, because they bring back memories and realities, are natural substitutes for states of phantasy, fear, and excitement.

In discussing this work elsewhere, Altshuler (1941) says: "The therapeutic principle of music rests upon close affinity between the human organism and rhythm as well as upon the symbolism inherent in musical sounds. But the chief significance of music as a therapy, I feel, lies in the mechanics of the human brain and the way musical sounds reach and affect it." Music is first perceived by the thalamus, while the spoken word, in order to convey a meaning, must be first "deciphered" by the cortex. As far as is known, the thalamus is not involved in insanity. "Stimulating the thalamus, one automatically incites the cortex. . . . Once attention has been gained it can, by using various devices, be prolonged." Music also possesses educational, cultural, and aesthetic attributes which cannot be measured, but which increase its value as a resocializing agent.

Further work at this hospital is being continued under
Altshuler's direction. In a report published in 1944 he wrote:

The attention at present is being shifted to the study of the structural elements of music, the divergencies as to pitch, inflection, and pause, and their respective physiological and psychological influence upon the human organism. It is amazing that with such a large body of information and observation regarding the various properties of music, little has been translated into practice. One would expect that a medium which affects emotion, the endocrines, the circulation, the respiration, the blood pressure, the mood, association and imagery, would be worthy of further investigation.

Various techniques and special manoeuvres may facilitate the response of mental patients to music. The "iso"-principle, or the principle of using music identical to the mood or mental tempo of the patient, has been useful. It was found that depressed patients, for instance, can be aroused more readily with sad than with gay music. Maniacal patients, whose mental tempo is faster, can be aroused more quickly with "allegro" than with "andante."
SOME INTERPRETATIONS

Lay persons who have written on music as a therapeutic agent have cited the cases of so-called cures as reasons for urging its extended use. Professional persons, while referring to these reports of beneficial effects, have been interested also in explaining how music exerts its influence and in establishing a reason for its action based on the underlying theories of their disciplines. These theories deal with the elements of music and the elements of psychology and philosophy, as well as with the totality of the disciplines.

Interpretations of the patient’s reactions to music reveal an interplay of effects compounded on the one hand of the personalities of composer-player-patient and on the other, of such extraneous factors as institutional program-attitude-environment. The literature on the interpretation of music is extensive, and it has been possible to cite only a few of the references that cover the subject matter.

There must in addition be considered the anatomy and physiology of hearing and the mechanics by which tone perception is translated into change of mood or bodily movement.
The classic work on the subject is the book by Helmholz. This topic has also been treated by the following writers as well as others mentioned elsewhere in this review. Billroth (1896), Watt (1917), in his treatise on the psychology of sound; Fletcher (1929, 1935), in his book on speech and hearing, and in the more technical treatment of the structure of musical elements; Mills (1935), in his discussion of the perception of tone, the recording of music, and the meaning of sound; Jeans (1937), in his book on the general topic of science and music; Stevens and Davis (1938), in the psychology and physiology of hearing; Wood (1944), in a book that he refers to as “the very interesting borderland between physics and music.”

Knudsen (1938) calls attention to important contributions of acoustics to clarification of cultural problems and suggests re-examination of physical foundations of music based on present knowledge of the nature of hearing.

An epical examination was made by Helmholtz . . . but this [book] dates back to 1862. Since then, modern acoustics has given us vastly superior research tools, by means of which many new and significant facts of hearing have been discovered. Inasmuch as the ear is the instrument by which we must judge what is harmonious and beautiful in music, we should search more fully for its secrets if we would know best how to please it.1

1 In 1932 the Acoustical Society of America initiated a joint project with the American Standards Association on the preparation of standards of terminology, units, scales, and methods of measurement in the field of acoustics (published in 1942). Standards are now in process of revision.
Many recent discoveries regarding the nature of auditory fatigue, subjective tones, and the masking of one tone by another present other pertinent musical problems which should be investigated in the laboratory.²

The significance of acoustics in both cultural and functional music is emphasized by Burris-Meyer (1947), when he says:

Defined in physical terms, music is an acoustical phenomenon. The field of acoustics includes all phases of music from the time the basic concept is first given actuality in any form by the composer, until the listener has reacted to the performance. Acoustics embraces: (1) The design of man-made sound generators. (2) The understanding of the structure and operation of the mechanism of the human voice. (3) All means of transmission of music to the hearer. (4) All means of recording and reproduction of music. (5) The physiological mechanisms and facilities by which the auditory stimulus reaches the nervous system. (6) Psycho-acoustics.

² There have been several studies on the nature of fatigue and the influence of noise, but the application of the principles deduced from these studies has received greater attention in industrial programs than in music therapy (see p. 199). Researches at the Psycho-Acoustic Laboratory of Harvard University, at Columbia University, University of California, and other laboratories, some in conjunction with the Office of Scientific Research and Development, are reported in the Journal of the Acoustical Society of America (see especially Vol. XVIII, No. 2, October, 1946, and Vol. XIX, No. 4, Part 1, July, 1947). Reports already published are available through the Publications Board, United States Department of Commerce, Washington, D.C. See also the preliminary report by Watkins and his associates (1947), which deals with the psychiatric, physiological, chemical, and endocrine aspects of fatigue, and the book on fatigue and impairment in man, by Bartley and Chute (1947); also materials in the periodical Federation Proceedings, in Biological Abstracts, Psychological Abstracts, and other research journals.
Scientific research has elicited some definite results in industrial music, but the study of music in medicine is only in the beginning stage. Further progress has been hampered by the fact that:

(1) The terminology of music is indefinite and inconsistent to a point where it constitutes a major impediment to mutual understanding on the part of those who create, perform, transmit, record, and use music.

(2) The criteria by which music and its meaning to, and effect upon, people are measured are so diverse as to render difficult the association of a musical principle or phenomenon with its effect upon those who hear.

(3) The extensity of the field of music is not generally understood by those concerned with its creation, use, or appreciation.

(4) There is no joint effort in which all groups dealing with music are represented to remedy these deficiencies.

Musical notation has been successfully combined with precise physical terminology in a few instances. When committing to paper the recording score for a record to be used for psychological screening, Cardinell found it necessary to define tempo in terms of actual time and dynamics in db as measured flat at a prescribed distance from the sound source.

Standard classification of musical forms lack sufficient uniformity to satisfy the requirements of those who must weigh and measure. They have serious shortcomings when one attempts to employ them in the musician's own task of program building. This has been forcefully demonstrated in functional applications of music where it is necessary to devise program patterns which are precise enough to assure a consistent mood progression. It has been necessary first to
develop, specifically for functional purposes, a musical classification scheme in which each term is defined in such a manner that the overlapping of categories is minimized, and term definition will not drift in the hands of many users.

Burris-Meyer recommends that the organizations concerned with music as an art and as a science should collaborate in:

1. The development of a common terminology for all people concerned with music.
2. The developing of criteria for the measurement of music and its effect upon people, and of suitable standards of reference.
3. The establishment of a facility for the exchange of information between individuals and groups engaged in research or developmental activities in various aspects of music, where no effective liaison exists at present.

The nature of the physiological basis for emotional expression has been investigated by Cannon (1929) in his research on the body's reaction in rage, fear, hunger, and pain. The review by Dunbar (1946) on psychosomatic literature, already mentioned, contains other contributions to this subject.

Hanson, speaking before the American Psychiatric Association in 1942 on a musician's point of view toward emotional expression, stated that music can be soothing or invigorating, ennobling or vulgarizing, philosophical or orgiastic. It has powers for evil as well as for good. But, inasmuch as emotional response to music is intimately
Some Interpretations

connected with such basic factors as consonance, dissonance, rhythm, melodic displacement, and the like, more concrete definitions of terms would be of value in analyzing and classifying different types of music for practical use.

He illustrated the development of consonant and dissonant relationships in musical history by examples of individual techniques that have contributed to particular types of musical expression. An analysis of these techniques requires a scientific musical background, and he repeats the warning that the emotional connotations of music are highly complex in character and are also more powerful than is generally realized.

In studying the relationships between music and the emotions it is necessary to consider "first the study of the music as an expression of the individual who creates it, second the study of music in relation to the age from which it springs, third the scientific analysis of musical technics and their relationships to musical expression, and fourth the study of the effects of these various types of music upon the listener."

In an address before the same group two years later Hanson called attention to the increase of emotional tension in music produced by a gradually increasing use of dissonance and discussed the vital effect of rhythm upon the subject of emotional tension in music. He defined rhythm as "essentially the combination or subdivision of time units within fixed metric patterns," to which music
largely owes its ability to produce effects which are soothing or exhilarating, quieting or disturbing.

The principles governing the effects of rhythm are:

First, everything else being equal, the further the tempo is accelerated from the pulse rate toward the upper limit of practical tempo the greater becomes the emotional tension. Second, as long as the subdivisions of the metric units are regular and the accents remain strictly in conformity with the basic pattern, the effect may be exhilarating, but will not be disturbing. Third, rhythmic tension is heightened by the extent to which the dynamic accent is misplaced in terms of the metric accent. Fourth, the emotional effect of "off-balance" accents is greatly heightened by an increase in dynamic power.

These principles are illustrated by reference to music with walking, marching, dancing, and jitterbug tempos.

Charles Hughes (1946), although he views the application of music as therapy favorably, states:

The extent to which rhythmic factors induce the appearance of such mental states [i.e., self-forgetfulness through absorption in music] has not been determined. In the case of dancers who forget themselves in the movement of the dance, the part played by rhythm is clearly very large. In most music the role of rhythmic patterns in attracting and holding the attention of the auditor would appear to be of great importance.

In spite of the tremendous challenge to every healing agency provided by two world wars, music therapy still presents many unstudied areas. The scientific verification of the
highly complicated question of the part played by rhythm in musical effects has been only partly accomplished.

The subject of individual response to music has also been surveyed by Licht (a physician) in his lectures to the students of the New England Conservatory of Music, published in book form under the title *Music in Medicine* (1946). He makes the plea here that the artist differentiate between the philosophy of aesthetics and the proved psychology of music, and cites Ortmann's statement to the effect that "the history of the problem is rich in uncoordinated data and poor in clear-cut conclusion."

Licht (1946) gives a résumé of the literature on the philosophy and psychology of music in Chapter II of his book.

Van de Wall, too, in a recent monograph (1946) points out that responses to music are compounded of sensory, perceptual, motor, social, associational, and other elements. Certain mental processes are directed by emotional impulses, and physiological processes of which the listener is unaware arouse subjective responses ("associational responses") in which the "emotional associations often tend to overshadow the pleasure or displeasure aspects of the sensory impression."

Liking or disliking a given musical stimulus or experience is conditioned by two factors: 1. Qualities objectively existent in the composition and originating partly in the physical nature of the sounds, such as pitch, intensity, tone color,
sequence, rhythm; 2. Subjectively ascribed qualities, derived from feelings and thoughts stimulated by and associated with the musical tone structure, and defined and evaluated on the basis of the listener’s physical, emotional, and intellectual capabilities and trends, his past experience, his present situation, and his needs (p. 23).

The question of whether or not music has therapeutic value concerns: 1. The physiological effects of music that fall under the category of physio-motor and sensory reactions; 2. The influencing of moods or feeling-tones which, if they occur, are a combination of the physiological and associational responses of emotional content. . . .

Therapy is the utilization of a stimulus whose effect is predictable. This predictability is based on a theory as to the causes for the effect of the stimulus and the subsequent testing of that theory in order to prove whether it is correct and under what conditions. The next step is the development of a procedure, which again must be tested, to insure that the desired effect from the stimulus will occur (p. 22).

In attempting to explain the influence of music, much stress has been laid on the subject’s reaction to the rhythmic element, especially as manifested in overt behavior, although it is recognized that no one component acts alone.

Ustvedt (1937) finds that for purposes of analysis it is important to keep in mind the distinction between rhythm and meter, however closely they might be intermingled in practice. "Measure comprises division into units of constant time-value and represents a product of the human intellect. . . . Rhythm is biologically conditioned, a liv-
ing, organic phenomenon” (p. 716). Both these time factors have a close relation to emotional association.

As regards the cerebral basis for the emotional aspect of music, the hypothesis is advanced that both the thalamus, with its importance for the affective tone of the special senses, and the vegetative-hormonal system (hypothalamus) with its probable relation to the bodily effects, together with the strio-pallidary system (presumably related to the affective-motor reactions) play a decisive part, while the cortex must be regarded as important for the associative factors. In opposition to the current conception of musicality as a purely cortical function, the view is here advanced that one of the central components of musical function—the emotional—must be regarded as connected with subcortical centres (p. 715).

Ustvedt bases his conclusions on his own series of clinical and laboratory studies of the musical function in patients with cerebral disease and aphasia, and a review of the literature that goes back to ancient Greek medicine.

Kubie and Margolin (1944) have demonstrated a point of great significance in the application of music for therapeutic purposes, which also manifests the inherent dangers in using the wrong kind of music. Their object was the study of the hypnotic state, and the concepts of monotony and rhythm were examined in terms of physiological and psychological dynamics. They have shown that rhythm has a physiological function in the induction of sensory adaptation, in addition to its importance in emotional states and in the general field of aesthetics.
A steady rhythm endows a stimulus with a quality of predictability, which in turn creates an unconscious attitude of relaxed and secure expectancy. . . . Partly through the sense of predictability which derives from it, rhythm gives rise to a feeling of security against the unexpected, creating a barrier against the startle pattern. . . . [See Landis (1939).]

Monotony is not merely a psychological concept with emotional connotations. It is at core a physiological fact in which the phenomenon known as "sensory adaptation" plays the initiating role. Sensory adaptation is created in any receptor organ by a stimulus of constant intensity which continues without interruption beyond a certain time, or by a stimulus of constant intensity which is discontinuous but which has a constant rhythm. Physiologically, sensory adaptation is a state of equilibrium in the sense organs which can be altered only by changes in stimulus intensity or in the metabolism of the organ itself. Both in amplitude and in rate these changes must exceed certain minimal limits which can be quantitatively determined. Psychologically, sensory adaptation is manifested by a diminution both in the subjective awareness of the stimulus and in the responses and reflexes which are normally associated with a similar stimulus of perceptibly fluctuating intensity. . . .

Furthermore, monotony exercises a cumulative and increasing influence on the activity of the organism. . . . Numerous observers have noted the hypnagogic effect of sustained monotony.

A psychoanalytic explanation of the association of music and feeling-tone has been attempted by Montani (1945). But his most recent reference to the theories of musicology "amongst the modern scientists" dates back to 1911.
SOME INTERPRETATIONS

The psychoanalytic interpretation of music has been reviewed by Coriat (1945):

[Music] creates not only a highly emotional reality but also the highest degree of unreality because it is marked by the absence of objective contents to which emotions can be linked. . . . The compulsion to repeat in music is not for the sake of repeating as a technical form of artistry but for the purpose of prolonging narcissistic pleasure along the goal already chosen through the unconscious activities. Thus this aspect of music presents what is so often found in the structure of the neuroses.

Coriat cites the work of Pfeiffer (1922):

Music is a recapitulation of libidinal expression; it is a means of escape from reality through rhythm which, through the process of psychic economy, provides pleasure through compulsive repetition, thereby releasing unconscious fantasies. The content of music is pure libido symbolism; it lacks objective content because the libidinal aspect of music has not reached the object level of development; consequently music is the only mental creation in which these libidinal processes can be found in pure culture.

He also notes that Rank and Sachs (1916) have stated "listening to music is usually with a minimum of effort and therefore can often lead to fantasy, thus breaking with reality situation."

Sterba (1946) resorted to subjective observations and concluded that "the transformation of musical experiences into hallucinatory pictures while falling asleep in
which the movement is experienced as the common denominator of the experiences, and which gives rise to the same pleasure feeling that the musical phrase occasions, makes us recognize the pleasure in motion as the essence of the musical experience.” This writer reveals his musical training in recording the remembered melodies by means of musical notation.

In the latest Proceedings of the Music Teachers National Association (1946), Altshuler reports the case of Horace F., a 45-year-old musician with a diagnosis of schizophrenia, catatonic type, who did not respond to treatments, but showed some awareness of reality only through the use of music. He defines the psychoanalytic concepts of id, ego, and superego and shows how music is related to the personality at the three levels of awareness.

Thus music has access to the Id, Ego, and Superego even if the spheres are not integrated and not working in accord, as is the case in a psychosis. Indeed, music tends to reconcile all these.

Music can work upon the psychotic mind and upon its various dynamic spheres (Id, Ego and Superego) as if the mind had not lost its emotional stability and mental function.

Allen (1946) chairman of the Committee on Functional Music, in commenting on this case history in his report, called attention to the dangers encountered in living only for music, and added: “The burning question is, ‘How can this man return to society, take up his part and become a useful citizen?’ Certainly not by just playing the
piano and pleasing the public. Perhaps he never can return via music at all!"

Tilly (1947) ascribes masculine and feminine attributes to specific forms of music and suggests that in considering music for therapeutic uses, certain principles evidenced in the composer's personality and works may be related to similar principles in the listener.

The qualities of "form," "impersonality," "drive," etc., she labels masculine. "Mood," "personal approach," "sentimentality," etc., she labels "neurotic feminine qualities (as found in the man)." The works of six renowned composers are analyzed briefly with respect to the qualities predominating.

As was mentioned earlier, some advocates of music therapy refer to results recorded in the study of musical aesthetics and cite the theories of musicology as established facts. Other scientific investigators, however, find that as research methods are improved, these postulates are not acceptable without modification even in the field of aesthetics and musical education. Their application in another branch of music as fact is all the more questionable, although of course they supply invaluable information that may be co-ordinated with other experimental data.3

3 The influence of music has been related to the healing power of art as an aesthetic experience. For a discussion of the relation of music to the other arts see Greene (1947) and the bibliographies by Hungerland (1945-1947). Sigerist (1943) also devotes a chapter to the topic of "Disease and Art" (pp. 196-211).
Schoen (1945, p. 106) explains the attachment of emotional connotation to music by saying:

Tones can carry the meaning of words because words are in themselves only sounds. . . . This is the reason why the composer is able to reproduce common human emotions in musical form. He can express anger, indignation, dignity, solemnity, fear, joy, exaltation, by imitating as closely as possible the characteristics of pitch, loudness, tempo, and quality of voice of a particular feeling, regardless of the musical worth of the expression.

Ruckmick (1945) in a technical paper on the perception of rhythm, makes the point that “the experiencing of rhythmic patterns is a phenomenon often employing several sense modalities and is probably peculiar to humans. In order to be complete the rhythmic experience needs more than one rendition of a unit measure as a stimulating pattern. The experience is grounded in time.”

Cazden (1945) relates the perception of consonance and dissonance in music to the cultural movements of the times, explaining that “these qualities are not inherent in perception as such, but are learned responses, adaptations to an existing pattern of the social group. Historical movements, changes in the social functions of music, and not the harmony of the spheres, control and direct transformations in musical structures.”

In an address before the American Psychological Association on the analysis of mood-characterizations and other factors of various types of musical phrases and
songs Gundlach (1946) reported that the results of his studies indicated "that the mood-qualities characterizing music may be estimated by analysis of the musical structure; and that most or all such terms may be located in three dimensions which may roughly be labeled power or dynamics, tonality, and motility."

Similar factors have been analyzed by Ward (1945), who discusses the effect of the basic patterns on the human being in terms of psychodrama. He writes:

Music, acoustically, is nothing more than sound frequency pattern, combined with rhythmic pattern. . . . That these rhythm-pitch patterns do have a profound effect on some of us, that they do indicate that the composer that chose to set them to paper did express a "gay" or "disturbed" or a "gracious" emotion at the time they were conceived, obviously must be due to some association between these patterns and the human mind. The answer is to be found in the fact that the organism also passes through a series of rhythm-pitch patterns as it travels through the emotional gamut of its existence, and that the passages played by one or a group of instruments bring these to mind. (The extent to which this association is exactly identical with the composer's original state of being is immaterial. A very substantial portion of the composer's original conception is inevitably present.)

Ward states that the following two difficulties must be overcome to gain the fullest benefit from music therapy:

First, the rhythmic frequency association must be sufficiently strong and active to allow the subject to project himself far enough into the full meaning of the music to allow
for a rewarding catharsis; hence the need for some kind of active music therapy.

And secondly, the experience must not be dulled or over-weighted by either an adequate technical prerequisite, or an overdose of foreign conserve element.

It is further apparent, that such a music expression is possible only if the subject is permitted to create music entirely within his physical or technical range and within his cultural atom. . . . It must also be remembered that a subject who has no knowledge whatsoever of music has only himself, his body and his voice with which to create music, or what Moreno has called psychomusic. . . .

And finally, though we do have a technical and even a conserve structure around which to build a spontaneous drama (psychodrama) in the speech intercommunication begun in earliest childhood, almost non-existent use of the music medium precludes a type of music which is very radically different from that which we have been accustomed to use in therapy work.

Ortmann (1946) has examined the various aspects of the subject, and stresses the close relationship of the physiological, psychological, and physical components in every branch of music (the beginnings of which he traces to the work of Helmholtz). Examples of this dependence may be seen in the elements of melody and rhythm. The former relies for its existence on the ear and tonal memory; the latter is accompanied by physiological movement, either incipient or expressed.

In spite of the difficult problems posed by this interrelationship, he finds that they lend themselves to objective
study. Their solution is dependent on the special training of the investigator in the technical and musical phases and in scientific procedure, as well as on the contributions of other experts.

Lundin (1947) observes that not only physiology and psychology, but also cultural factors determine the criteria of musical consonance and dissonance. He states:

The fact that people in different musical groups adopt different criteria for their judgments of consonance has been demonstrated by Bugg, who found musically untrained persons more influenced by affective factors than the musical ones. Valentine has shown that interval preferences among children differ from those of adults and further, that children’s preferences will differ from each other markedly since no two people have had the same musical life histories.

Theories regarding even the basic concepts of musicology are undergoing change, as may be seen in the statement by Mursell (1947), who holds that the scale is not a mere mathematical sequence, but a “mental organization”—a psychological and social agreement.

Seashore (1942), whose name is synonymous with research in music, sums up the case for co-operative work in any problem related to the understanding and use of music, in the following statement:

Scientific methods are now coming to be employed for the discovery and guidance of musical talent and for the development of musical skills and musical appreciation. The
artist is confronted by his performance score, and the philosopher and critic are confronted with the necessity of reconstructing their terminology in musical esthetics. However, even with these exceedingly promising new approaches to experimental esthetics in music, the experimenter is dealing with only a small part of the esthetic problem. Science only shares in the division of labor with the educator, the performing artist, the critic, the composer, and the philosopher. Still, the scientific approach has one advantage—namely, that it has faith in the possibility of separating the true from the false in theory and practice by experiment. It enjoys the satisfaction of actually catching an element of beauty on the wing and discovering what it is, whence it came, how it revealed itself, and why it was beautiful. But it has also one great drawback. Of the millions of possible aspects of beauty, it must be satisfied to deal with one little specific factor at a time and limit its conclusion to that specific factor or its logical derivatives.

In his recent book Seashore (1947) takes up more fully the subjects of science in music and musical aesthetics and the relation of the acoustical laboratory to the principles of measurement in musical aesthetics.

However, subjective as well as objective variables modify the listener's perception, feeling, and understanding. Among the psychological factors mentioned by Seashore as determining likes and dislikes which affect the composer, the performer, the listener, and the critic and must be controlled in objective measurements are matura-

tion, training, talent, meaning, empathy, the aesthetic mood.
One of the problems in the therapeutic use of music is the fact that to enjoy music the listener must be in a sympathetic mood. He must be receptive to music and feel the need for it. It makes a great deal of difference whether a patient is temperamentally in a joyous mood or a depressed mood. In each of these, he may recognize numerous varieties, such as frivolous, playful, satisfying, or aggressive, defiant, militant, or surrendering in the negative mood.

We have found that if music is to be used at all as a therapeutic agent in psychopathic hospitals, it has to be "tailor-made" for the patient. The same principle operates in normal mental life. We not only have different training, education, tastes, and experience which influence our response to music, but these and many other factors vary from day to day, from morning to night, from waking life to dream life. They are therefore strong determinants in the esthetic acceptance or rejection of the music for the moment (p. 187).

As this review goes to press, there appears an announcement of a book entitled *Music and Medicine*, edited by Dorothy Schullian and Max Schoen, to be published by Schuman. This book is a scholarly presentation by sixteen authorities showing the general relationships between music and medicine and tracing the background for the belief in the influence of music from the earliest times.

There are eight chapters dealing with the history and philosophy of the subject. In addition, one chapter takes up the matter of occupational diseases to which the musical profession is exposed and one deals with the subject of doctors whose avocation was music.

Five chapters cover the modern period—two give an
analysis of the various aspects of music; three discuss the use of music in a military hospital, in psychiatric practice, and in industry. The last chapter considers the question of theoretical aesthetics, with special attention to the art of music.


Reprints of works by the following authors form additional chapters. Henry E. Sigerist, "The Story of Tarantism"; Fielding H. Garrison, "Medical Men Who Have Loved Music"; Howard Hanson, "Emotional Expression in Music"; Ira M. Altshuler, "A Psychiatrist's Experience with Music as a Therapeutic Agent"; Willem van de Wall, "Music in Hospitals."

There is also an extensive bibliography.
UNTIL RECENTLY most of the literature not concerned with experimental work dealt with music in a general way, stressing the desirability of its use rather than the number and type of patients whom it served or the kind of programs available.

Some writers, however, have made a distinction between recreation and therapeutics, and a few of the publications discuss these practical aspects of the problems to be met in a music therapy program, namely, group and individual activities, timing, active and passive participation, music education, as well as supervision, training, and equipment.

(The relation of music making to occupational and physical therapy, the use of music in anesthesia, and its application in industry, will be taken up in the following chapters.)

An important work that deals extensively with these details and is based, not on isolated laboratory techniques, but on observations carried on in the field, appeared in 1936. This work was initiated some fifteen years earlier as part of a program in the State of Pennsylvania designed
to better the conditions of the patients in mental hospitals and correctional institutions. The Secretary of Welfare, reporting on this program in 1924, wrote:

Music, both vocal and instrumental, dramatics, social club meetings, all afford opportunities for self-expression and tend to promote more normal human relationship. Patients also become more amenable to discipline and cooperate in examinations more fully. Nurses and other employees become more interested in their work, and the morale of the whole institution is raised by such activities (Pennsylvania Department of Welfare, 1925).

The musical portion of the new program was placed under the direction of Willem van de Wall. The findings are of special interest, because in addition to presenting direct field observations they have been evaluated in the light of established psychological principles. These principles and their application in musical education and as therapeutic aids have been set down in his volume on *Music in Institutions* (1936). The large number and variety of persons on whom he has had a chance to observe the effects of music in a number of widely scattered institutions make this report of unusual value, for he worked with normal adults and children as well as the mentally and physically handicapped, the maladjusted, and the socially isolated individuals.

In that book he suggested:

Joint study by medical and music departments in a mental hospital [which] presupposes (1) a scientific medical atti-
tude toward every detail of hospital treatment; (2) a well co-ordinated system of centralized medical control and direction of the patients' activities; (3) such a grouping of the population as will make a comparative laboratory study of smaller numbers of patients in conditioned situations a practical possibility; (4) in the conception of mental treatment the inclusion of non-medical factors that are significant for social living and scientific control by the medical department of every activity involved in treatment; (5) familiarity on the part of the music director with scientific technique so that the data and observations which he submits shall be dependable and complete; (6) his ability to co-operate with the physicians by translating musical endowment, skill, progress, preferences, and like technical matters into psychological information; (7) resourcefulness in suggesting experiments and working out tests; (8) co-operation with the physicians in keeping records of the research cases (p. 343).

Such a study, van de Wall felt, would clarify some of the emotional thinking prevalent in music therapy. He wrote (1936):

Most people are ready to believe that music possesses therapeutic properties, partly because there is a great deal of poetic testimonial literature about such qualities. Under objective scrutiny this "magic of music" assumes a very different aspect. The various kinds of musical stimulation may be divided into two classes, those whose psychological effects are due to objective qualities [the sensory-motor and the sensory response] and those whose effects are due to subjectively projected qualities (p. 72).

If definite types of musical stimuli seem to produce definite effects in most people, we may not regard them as more than
conventional and psychologically superficial effects. As soon as the deeper-lying psychological reactions and responses are expressed, they reveal a variety of influences as great as the differences in situation and personality make-up of the person subjected to the same type of stimulation (p. 74).

A large portion of this book deals with detailed methods for conducting activities with bands, orchestral groups, and vocal groups; the use of these groups in other social and occupational activities; instruction of individuals in the playing and appreciation of music, and the place of music-making in treatment.¹

Various types of institutions provided music in some form following the establishment of the Pennsylvania project. In New York State, for instance, Wells reported in 1928 that “for the past few years . . . there has been a scientific investigation of music as a means of reconstruction and discipline and to verify its therapeutic value.” Her recommendations were similar to those previously quoted.

Many hospitals simply availed themselves of services provided by amateur or professional musicians who came to the institution at irregular intervals and presented con-

¹ The book contains selected bibliographies on social education, social work, mental hygiene and psychology, criminology and penology, the physically handicapped, nursing, and occupational therapy, in addition to music, which includes vocal, instrumental, ear training and elementary theory, creative music, conducting, music appreciation, history, biography, and miscellaneous books; also dramatics, pageants, and festivals (play production, acting, costuming, stagecraft, etc., dancing, singing, dramatic and social games).
certs of popular and classical programs worked out with the occupational therapy director or other official who may have had an interest in music.

This form of therapy was used mainly in hospitals for nervous and mental diseases (Grothe, 1926; Harrington, 1939; Pratt, 1940; Gardner, 1944), but it was also employed in tuberculosis sanitarium (Mays, 1916; Bell and Ilsen, 1925); and in general hospitals and veterans’ facilities (Harting, 1919; Davis, 1929; Moore, 1939).

Larson (1928), in planning for veterans of the first World War, stated that while games and sports were good convalescent treatment, music had the outstanding beneficial effect of soothing and cheering the wounded and the shell shocked. He cautioned, however, against allowing disabled men to indulge in music merely as a recreation. “No matter what the degree of a man’s incapacity he can enjoy music and derive benefit from it. In case of nervous disorders . . . it is frequently the one medium through which he can be reached.”

From his experience in a veterans’ hospital, Pierce (1934) became convinced that although music may not express the same meaning to different listeners, it is expressive in some way. It stirs emotions and influences moods. It engrosses attention, and to a few it is an intellectual challenge. A measure which holds the attention of the patient and favorably influences his mood and his emotional life has therapeutic possibilities also for those suffering from mental disease.
In passive application, the means used are concerts, instrumental or vocal (in person), the radio, and the phonograph, as well as motion pictures. These measures also affected the hospital atmosphere—the patient's environment. Veterans' organizations or others provided musical entertainment twice a week, and records were played for about a half hour before and after the showing of each picture. Music was also furnished by the hospital orchestra or the radio during the noon hour and in the early evening.

Active application of music has added advantages. The intellectual field is stimulated; the conquering of an intellectual task gives satisfaction and enhances self-respect. It not only arouses emotional activity, but an outlet for emotion is provided. Co-operative effort tends to break down the sense of isolation so common in mental diseases. The one form reaching the largest number is singing, either in large or in small groups. Some 700 men may be present in the auditorium. In the small groups, there is the impromptu sing in the wards, and the singing by groups of specially trained patients.

The instrumental organization consisted of a harmonica band, with twenty to forty members, and an orchestra. No reading of music was attempted. Simple melodies were played by ear, the piano leading. This group was usually given a place on every program supplied by the hospital.
The orchestra was increased within a period of three years from three patients and two staff members to more than sixteen musicians, twelve of them patients. It consisted of six violins, one cello, alto, tenor, and baritone saxophones, three trumpets, a trombone, a bass horn, a banjo, drums, traps, and a piano, and concerts were given daily in the dining room, biweekly for dances and other entertainments, and occasionally outside the hospital.

Pierce lists the following principles that have been found effective: Playing must be made pleasurable for the members. While striving for improvement, it is best to have some easy numbers at each rehearsal or concert. Tuneful music that can almost be read at sight is useful. For formal concerts, thorough rehearsal, to assure playing without strain, is important. For a selected group, a two-hour period with a fifteen minute recess is not too long. The patients themselves seem anxious to lengthen, rather than shorten the practice time. It is better to have individual practice carried on with an instructor. Public performances outside the hospital have many advantages and have "overcome any possible feeling of humiliation in its being known to the public that [the players] are patients in a mental hospital." But under no conditions should the orchestra be commercialized. The inclusion of a few staff members and carefully chosen personnel who are only indirectly connected with the hospital seems to
be advantageous in order to lend variety to the playing, and in other ways.

With regard to the comparative advantages of active and of passive participation, the observations of Ziegler (1924) and of Mower (1940) may be of interest. In order to study the recreational and amusement tendencies of men with mild nervous disorders, each of one hundred psychoneurotic ex-service men was asked to select from a list of seventy-seven activities known to be available in the community the ten which he liked best. Similar choices were obtained from forty-eight college men.

The nervous patients selected (on paper) more of the passive and less of the active recreations than did the college men. Even this list did not represent actual participation, for the nervous patients indulged in far fewer recreations of any type than did the college men, and those they did engage in were predominantly passive.

<table>
<thead>
<tr>
<th>Active</th>
<th>Psychoneurotics</th>
<th>College Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dance</td>
<td>29</td>
<td>67</td>
</tr>
<tr>
<td>Play musical instrument</td>
<td>21</td>
<td>12</td>
</tr>
<tr>
<td>Sing</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>Play in orchestra</td>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Passive</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Go to hear musical program (vocal)</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Go to opera (exciting)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Go to opera (pleasant)</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Go to hear musical program (instrumental)</td>
<td>20</td>
<td>27</td>
</tr>
</tbody>
</table>
These items relating to music were selected from the table prepared by Ziegler (distinctions are even more pronounced in some of the athletic activities listed therein).

Mower (1940) made a comparative study of hobby activities among eighty individuals—forty maladjusted and forty controls. In the maladjusted group only nine persons expressed an interest in music; in the controls, seventeen. Mower found the maladjusted were less able to select a hobby, and urged that they should be encouraged and helped to do so.

Levine (1942) recommended the development of musical talent in patients as a hobby, provided the hobby does not become an obsession and provided the type of music chosen conforms to the taste of the patient, not that of the physician.

Active participation in music has a deeper significance than that of recreational or occupational therapy. Allport (1946) makes this point in another connection in discussing the psychology of participation, when he says: "People must have a hand in saving themselves; they cannot and will not be saved from the outside." And active participation in hospital activities gives the patient a feeling of taking part in his own rehabilitation.

After having tried a music program for two years, Thompson (1932) became convinced that the psychotic patient derives great benefit from such activities. This

2 The National Music Council (1947) reports that music ranks second as a hobby among the general population, as divulged in a recent survey.
veteran's facility used an orchestra and a drum and bugle corps, plus community singing. Although all members of the orchestra had had some training, two-thirds of the group had to practice many hours to qualify for ensemble work, yet this was done at the patient's own initiative. For those who were too timid (underactive tendencies), the necessity of keeping up with the others and the realization that they were doing so acted as an antidote. For the highly strung (overly active), the necessity of slowing down to an appointed speed had a steadying effect. This author suggested ending each practice period with something that all could play very well. The earliest endeavors should include well-accented rhythms, and a feeling of achievement should be encouraged. For example, part singing was not successful, but general assembly singing in unison was much better.

Richter (1934) observed that music has a definite place in the treatment of the mentally ill in conjunction with other therapy. However, it is better to have the program entirely under hospital control and the musical activity should be under the direction of one who understands psychiatry and who is himself responsive to music. Among the beneficial effects are the pleasure derived by the listeners (passive participation) and the self-confidence and inspiration developed in patients who take part in the band (active participation).

The general music program of the Pennsylvania Hospital for Mental and Nervous Diseases (Kalms, 1942)
provided ward community song periods twice a week; individual music or language lessons twice each week per patient; dances two evenings each month; one evening each month an outside group presented a play for the patients. In addition, there were movies once a week. The number of patients reached by music and allied activities varied from year to year between 50 and 60 percent. The writer noted that no hard and fast rules can be set down as to programing. Advances in the medical treatment of mental patients have tended to reduce their stay in the hospital, and music therapy will have to be modified to conform to the new methods.

In one hospital where psychiatric patients were sent chiefly for diagnosis and their short stay and the crowded conditions made individual treatment difficult, music was used in several different ways (Schreiber, 1943): for group singing, dancing, and sedation with hydrotherapy. One woman worked all afternoon when music was available, whereas before that she had never sat still long enough to perform any task.

Music has been utilized in an unusual manner to gain insight into a patient's problem. When a girl who had been an invalid all her life was asked to draw while listening to music, the drawings expressed her desire for pretty clothes and a fuller social life. These picturizations coincided with her physical state, showing her with cyanotic face and choking band around her throat when she had asthmatic attacks, but an open window at which were
The application of music

Curtains blowing in the breeze on the day when she was free from dyspnea.

In another hospital for mental diseases (Donais, 1943) the interest in music led to the production of musical plays. In addition to regular orchestras, the pipe organ, the mandolin, the ukulele, and the English recorder were found useful, and choral activity proved to be a socializing influence.

Altshuler (1944 and 1941), in a report on the use of music over a four-year period, observed that the raw material of music is intimately linked with instinctual drives, and its influence has been proved beyond any doubt. When this program was inaugurated at Eloise Hospital, ward music was provided for half-hour periods five times a week. A theme song lured the timid ones into joining the group. During 1941 there were as many as twenty-four trained musicians. They were coached in the various details of music therapy and in how to deal with mental patients. In the first three years of the program more than 850 patients had been “exposed to music.”

It was found that “the mobilization of attention and prolonging of its span can be more easily achieved, if one begins with music which appeals to the lower brain levels. Musical rhythm which has a strong affinity to bodily rhythm is thus used first.” This is followed by melodic and mood-modifying music, while harmony and pictorial-associative selections, being of a still higher degree of complexity, come last. In thus presenting a pro-
gram of regular sequence it is possible to appeal to different patients, for some are responsive to melody, others to pictorial music, and so forth.

One outgrowth of the “immediate need” referred to earlier, which again focused attention on the lack of available information, was the publication in 1944 of a survey by the National Music Council to determine the extent of the use of music in hospitals—the first such survey on a national basis.

According to the report, the objective of the survey was “to collect general information as to practices and ideas, rather than to secure for purposes of statistical analysis great numbers of detailed items in regard to a technic which has not yet been carried to a point where it can be standardized.”

A questionnaire was sent to 341 hospitals (including veterans’ institutions), but the survey was limited to hospitals treating mental and nervous diseases. Replies to the questionnaires were received from 209 institutions, which included one government hospital, one United States medical center for prisoners of the United States government, five army neuropsychiatric hospitals, fifteen veterans’ hospitals, 128 state hospitals, one state hospital for insane criminals, six county hospitals, nine psychopathic hospitals and institutes, one neurological institute, and forty-two private hospitals and sanatoria. These replies were analyzed by Dr. Samuel W. Hamilton, mental hospital advisor with the United States Public Health Service,
and Willem van de Wall, director of the Committee for the Study of Music in Institutions.

The questions submitted and excerpts from the replies (p. 3) are given below.

1. Do you use music in your hospital for the patients?
   One hundred and ninety-two of the 209 hospitals answered in the affirmative and 14 stated “no.” . . .

2. What opportunities for listening are offered to the patients?
   a. Music by performers: 160 hospitals mention the personal appearance of instrumentalists, and 150 of singers. Concerts offered to patients take place as a rule occasionally, only in a few instances regularly, varying . . . from a few times per year to twice a week. . . . Most hospitals depend for performers on talented patients and personnel. . . . A few hospitals permit selected patients to attend concerts under proper escort in the neighboring community.
   b. Recorded music: 151 hospitals use phonographs in various ways. . . . Specific uses include listening to symphonies under guidance of a trained musician, music appreciation classes taught and illustrated with records, etc.
   c. Radio music: Only 4 hospitals indicated that their wards do not possess radio facilities. . . .

3. If patients take an active part in the music, do they participate in:

In some institutions the music making by the patients consists mainly of playing of piano, accordion and other instru-
ments, and of informal individual and group singing. In others, activities are organized under professional as well as amateur leadership. In several institutions formal music instruction is given to individuals as well as to groups. . . . Forty-nine institutions carry all of the activities listed in the questionnaire, and 17 fail to record any musical activities by the patients. . . .

4. What is the background of your musical director?

5. Is your musical director a volunteer? employee? amateur? professional?

. . . Of the 75 music directors reported to be in charge of the hospital music activities, 41 are professional musicians and 34 are amateur musicians. Of the directors listed as professional musicians, the following educational backgrounds are given: Conservatory 6; conservatory and college 8; college music 10; college education for public school music 8. Among the musicians in charge of activities are 8 professional organists, 4 choir leaders, 3 singing and piano teachers, 3 piano teachers, 7 bandmasters, 7 orchestra leaders, 1 violinist, 1 symphony trombone player, 4 music students, 1 entertainer and light opera singer, 4 vocalists, and 12 public school music teachers.

Of the employees in charge of hospital music activities but not specifically and exclusively employed and listed as professional musicians, the following categories are recorded: Occupational therapists 18, recreational aides 14, nurses 6, attendants 3, and . . . one each [of institutional staff members]: woman physician, physical educator, secretary, bookkeeper, sewing teacher, business man, kindergarten teacher, recreation-room caretaker, show director. In two hospitals talented patients have been put in charge of the music program. Volunteer service as music leaders is given
by Red Cross workers in ten hospitals, and by members of
the community in two institutions. . . . Forty-one hospitals
have listed music activities by patients without the benefit
of specific leadership.

6. Is there an appropriation for music in your budget?
   Forty-six hospitals replied “yes.” Thirty-two additional
   institutions qualified their affirmative answer. Of these, 7 in-
   dicated that their budgets contained specific items for music.
   Four hospitals described their music appropriation as small,
   very small, small and not adequate, $100 a year. Five hos-
   pitals report appropriations for musical supplies. . . . One
   hundred and two hospitals have no appropriation for music.

7. Where do you look for a musical worker when you have
   a vacancy?
   Sixty-seven institutions mention the following sources:
   the hospital personnel . . . professional music schools, or-
   ganizations and agencies . . . governmental and state agen-
   cies . . . other sources in the community.

8. What principal qualification should workers possess in
   order that their services may be valuable in hospitals?
   One hundred and forty-seven institutions answered this
   question, often in considerable detail. The many data pro-
   vided are listed under four headings: (1) Musical back-
   ground; (2) Personality traits; (3) Attitude toward mental
   patients and mental hospital work; (4) Training and experi-
   ence in mental hospital work. . . . [These are discussed at
   length in the report.] According to the opinion of one medi-
   cal director, the principal qualifications which a hospital
   music worker should possess in order that his services may
   be valuable “have not been established. Advanced training
   in music may have little bearing on this question—the quali-
fications are still to be established from the results of research problems which should be carried out accurately in terms of the scientific method."

9. Could your hospital use additional qualified workers?
   Ninety-two institutions answered this question in the affirmative. . . .

10. Do you consider that your use of music is recreational or genuinely therapeutic?
   Replies of 187 institutions disclose that 30 hospitals consider their use of music "recreational," 23 "therapeutic," and 134 "recreational or therapeutic." From the 129 more detailed opinions, the following composite picture presents some of the main ideas and practices:
   Music is used as a recreation when and where applied informally; when it is used without medical prescription and proper supervision; when patients partake passively as an audience or actively in groups. Other opinions are that "recreation is therapy," that "a distinction between the recreational and therapeutic application of music is theoretical and academic," and that "in practice both uses overlap." In other replies definite therapeutic potentialities are ascribed to the use of music and medically beneficial results are mentioned.

   Active participation in the making of music is generally considered more valuable than listening. . . . It is regarded as especially beneficial for those individuals who have sufficient ability and contact with reality to learn to play musical instruments, or in the case of those who have had musical training prior to becoming mentally sick. Orchestral playing has been found very helpful in combination with psychotherapy. . . . Instruction in music is considered of definite therapeutic value for patients with musical inclina-
tion and erudition. It has been found to create new cultural interests as well as to revive dormant ones in many patients. Classes in music appreciation are held to revive and arouse an intellectual enjoyment of the art. . . . A properly qualified individual having definite understanding of mental patients, having "rapport" and a feeling of their needs is regarded as essential to give the music work the proper recreational as well as therapeutic significance.

Commenting on the findings revealed by this survey, the authors of the report state:

The two outstanding practical needs shown by this survey seem to be the medical testing of music as to its therapeutic qualities, and the development of standards and curricula for training of qualified personnel by educational institutions on the basis of careful planning and cooperation with hospitals.

Licht (1946) recommends that music be used in psychiatry for its value in listening, group participation (singing, bands, etc.), and the creation of sounds (playing of instruments). In discussing the application of music to psychotherapy, he provides a brief glossary of common mental disorders that should be helpful to the musician who is to collaborate with the hospital personnel in following the treatment of these patients.

This physician mentions a number of other ways in which music may be helpful in a hospital or institution, namely, as background effect (except for those who dislike music), for exercises and dancing, and during shop
work, though he does not recommend it where mental concentration is required. He lists a number of recordings suitable for mealtime music, when the elements of melody, rhythm, and softness should contribute to relaxation. Vocal music and strange instruments should be eschewed in favor of stringed instruments, piano, or harp. He also discusses the place of music in diversion and entertainment, the problems to be met in furnishing music for bed patients and for convalescents, and the functions of a public address system in a hospital.

A very important application of music, Altshuler notes (1945), is its use as an adjunct in group therapy. For the patient who is in an institutional environment where his movements are regimented, any project that would introduce freedom of action is to be sought for.

Music provides a feeling of unity and belonging. Case after case of uncooperativeness has improved when musical activities were provided. Attendants inclined to be adverse to any procedure that might break the prescribed routine, are soon won over when they realize how music therapy lightens their own tasks. Indeed, the effect upon the attendants is as important a factor as the benefits to the patients.

In one state hospital (Crampton, 1946) a group was organized of those patients who were able to play musical instruments. To provide a goal for the group, a half-hour broadcast was arranged over the hospital network once a week, and this program was placed in charge of the librarian. The orchestra also played for patients' dances and
for theatrical and movie programs. For those who cannot participate, regular ward concerts are furnished. Such concerts by the patients tend to bring others into the active group. The department of occupational therapy also encourages musical shows as part of its dramatic program, so that as many patients as possible may be given a part.

In another hospital for mental patients, where the therapy is group-centered, the patients assumed an active part in the recreation by improvising song parodies, which were set down by the student nurses. As these represented the free expression of the convalescent patients, the persons who assisted them in writing down the words were able to gain additional insight into the patient's mental condition and his attitude toward his surroundings (Isham, 1945).

Among these reports there appears from time to time a reminder that the effect is not always favorable. Ruegnitz (1946), after discussing a typical program of entertainment and patient-centered music, at a hospital for mental diseases, adds: "Keenly aware that music can be a means of inducing in patients emotions which they do not want, we have always seen to it that the door to the music room is left open, so that if the patient feels that he does not want to listen, he may leave the room without interference." This writer also mentions one patient who had had excellent musical training, who was wont to play the piano when she was in an elated mood, but
usually reverted to being merely a listener when she was in an improved state.

Group therapy in the form of psychomusic based on Moreno's development of the psychodrama is described in a symposium. This method "uses mainly five instruments—the stage, the subject or patient, the director, the staff of therapeutic aides or auxiliary egos, and the audience" (Moreno, 1946A, p. 249). The patient becomes a creative agent and acts out the problems that have been troubling him, thus suggesting their solution and his own release.

Moreno states that in the psychomusical drama the procedure is similar and centers around four problems:

(a) The idea of participation—how to get the group started so that it may participate passively as well as actively, helping to define a social theme and to crystallize a musical drama;
(b) the idea of spontaneity. . . .
(c) the idea of individuality, freedom of experience [to become of the group, but not merged in it];
(d) the idea of spontaneous leadership arising from within the group. . . .

The aim of psychomusical work is psychomusical catharsis. The catharsis accomplished depends upon the degree of participation and the degree to which spontaneity is individually and collectively aroused (1946, p. 278).³

(See also the discussion of musical elements in terms of psychodrama by Ward on p. 97.)

³ Moreno (1946, p. 286) also describes the psychodramatic method of individual treatment employed in the cure of a skilled violinist who had a performance neurosis.
Interest in the possibilities of music was also evidenced by military agencies. The Armed Services had found it advantageous to employ the group-therapy method for various purposes in a number of hospitals. Group psychotherapy was resorted to not only because it made the most use of limited time and personnel but also because it provided a social milieu for the patient. His identification with the group and the development of a sense of belonging encouraged normal reactions and facilitated resumption of outside social responsibilities.

One experiment in the use of music in group therapy for servicemen was conducted in an AAF Convalescent Hospital. This program was carried on with a staff of eight highly specialized enlisted men and the co-operation of the regular band and the Education Branch at Fort Logan. McKay (1945) describes the activities as follows:

The Music Therapy Program was set up in such a way as to afford music instruction on any instrument. It also offered diversional opportunities through the media of the hospital public address system; by supplying musical instruments for practice and for instruction purposes; by making on the spot transcribed recordings either in the Music Therapy building or at a patient’s bedside.

The Education Branch taught the ambulatory convalescents how to make the parts for and assemble miniature pianos and to repair musical instruments, and instructed a group of musicians in short-cut methods of
teaching patients, almost all of whom came voluntarily to the music building.

All this time the Music Therapy Project was working with the help of . . . specialized medical services in the hospital . . . army doctors in charge of Orthopedics and Physiotherapy, Psychiatry, General Medicine and Surgery. Under these men it received suggestions for proceeding and instructions to patients. The Chief of Psychiatry was appointed medical head of Music Therapy.

To determine the best type of music for the listening (bed-ridden) patients, the staff canvassed the hospital, distributed program notes, sent request slips for patients' choice, organized contests. One NCO, previously a patient, kept records, charts, and graphs indicating hours of patient-participation and so forth. Another NCO taught music. Both had been successful civilian teachers and musicians.

By 1945 there were two buildings where music instruction was available. There were also a record library, containing some 6,000 records, a music appreciation room, equipped with an electric record-player, and another library holding albums of concert and popular music.

In another army hospital group singing was employed three times a week in the rehabilitation of patients suffering from aphasia. It was found that "the associations and rhythm senses tapped," in response to old songs, provided a stimulus to speech (Sheehan, 1946).
Paperte⁴ (1946) has published a report on the first one hundred psychoneurotic patients treated at the Walter Reed General Hospital over a six-month period during the war, when a group of musicians provided special music according to a predetermined plan.

Criteria set up for judging the music to be used, are given by Paperte as follows:

I. All music for use in hospitals, as per the Institute of Musico-Therapy's plan, should be first generally classified as follows: A. Music of solely rhythmic interest. B. Music of solely harmonic interest. C. Music of solely melodic interest. II. Of the first group (I), each subheading (A, B, C) should then be divided into two groups each (slow, fast) as follows: A. Music of modal nature—slow, fast. B. Music of classic nature—slow, fast. C. Music of romantic nature—slow, fast. D. Music of impressionistic nature—slow, fast. E. Music of modern modal nature. III. Of the second group (II), each subheading (A-E) should finally be subdivided as to key, length of piece, tempo, and character (program or absolute-music).

Titles of music are not mentioned. The piano was the instrument most often used, although violin, cello, harp, and solovox attachments were also employed.

The treatment consisted of three parts. During the first, the "mood-determining period," music similar to the patient's mood was played, this being changed gradually to the feeling tone required by the prescription of the medical officer. An interim period was allowed in which ver-

⁴ The founder of the Music Research Foundation, as noted on that organization's letterhead.
bal rapport between patient and musician might be established. The patients were then given a chance for active participation. This might take the form of "comments, queries, requests, or through humming, beating time, singing, whistling, or following the score." Some asked for and were given private instruction.

Paperte has given in tabular form the observations recorded on some of the patients. Where treatment was available for seven days or longer, her comments indicate that there was "some improvement." The length of stay in the hospital was so uncertain that results could not be compared with control data. The lack of a direct- ing psychiatrist was a serious handicap, both in evaluating the records kept by the musicians and in interpreting the actions of the patients during the periods when they became active participants or responded in some other way to the urge of the music.

At Old Farms Convalescent Hospital, where blinded veterans are taught to adjust to their disability so that they may return to an independent livelihood, music was introduced as one of the many other activities in a varied program of rehabilitation and retraining (Bernstein, 1946). Informal groups of singers were encouraged by staff participation. Instruction in the use of instruments for accompaniment to popular tunes was given by rote. Those especially qualified to study music were taught to read notes in Braille. All activities, however, were voluntary.
Several men who had other disabilities in addition to blindness were also trained to participate in musical activities. To show how this was done the author relates the story of one veteran who learned to play the trombone in spite of the fact that he had lost his right hand and had only the thumb of the left hand remaining.

For some of the men, especially those who required relaxing occupations, an informal music appreciation course was organized. Several of them developed their own record collections as a result of this new interest, and it was felt that this course had real therapeutic value for the nervous patients and gave all the men additional facilities for recreation after they left the institution.\(^5\)

A psychodramatic unit based on the theories developed by Moreno has been set up at St. Elizabeth's Hospital, Washington, D.C., in order to orient the patients about to leave the hospital (Franz, 1946). Psychodrama is said to serve the dual purpose here of preparing members of a hospital community for life outside and training people from outside to meet situations within the hospital community.

Solomon and Fentress (1947) have also published a critical study of analytically oriented group psychotherapy, following the clinical study of psychodramatic treatment.

\(^5\) Among the occupations listed as being suitable for the visually handicapped Ryan (1941) includes vocational music, in addition to piano tuning and repairing.
A combination of color, sound, and motion (in the form of "Auroratone films") has been used experimentally by the Neuropsychiatric Section of the Army Medical Service in the treatment of soldiers with psychotic depressions. In the preliminary report published by Rubin and Katz (1946) the films are described as "abstract colors in multi-formed crystalline shapes, blending and ever-changing in synchronization with accompanying slow, sedative and somewhat sad music." The music used was "Clair de Lune," "Going My Way," "The Lost Chord," "Home on the Range," "I Dream of Jeanie with the Light Brown Hair," and "Ave Maria."

The authors report:

Observation has revealed certain behavior patterns characteristic of the reactions of many of the depressed patients. First, most patients evidenced intense absorption in the pictures and in the music. Their eyes remained on the screen during the showing, with the exception of moments of restlessness from time to time, usually during the few seconds between selections when no music was played. This absorption has been observed in many patients who have been exposed for as many as fifteen times to the same series of films.

Second, physical relaxation appeared to spread over the patient during the course of the film showing. Even in the violently agitated, there was a progressive relaxation, while stereotyped motor phenomena became less intense or disappeared.

Third, many patients wept during the playing of certain selections. . . . However, tendency to weep did not persist after many repetitions.
Fourth, most of the patients became more accessible following the Auroratone presentation. Weeping provided an emotional catharsis which rendered the patient more open to individual and group psychotherapy. Patients previously mentally blocked with speech retardation, established rapport with the psychiatrist and spoke more freely following exposure to the films.

See, in this connection, the discussion of "colored hearing," on p. 77, and the explanation by Kubie and Margolin (1944) of the hypnagogaic effects of monotony and rhythm, p. 91.

The use of music in military hospitals was organized in 1944 on a more extensive scale as a part of the reconditioning program (rehabilitation). The reports on Mariner's work in line with this program are included in Chapter VII.

Ainlay (1945), an army doctor, writing on the place of music in military hospitals, states that its possible application "has not been properly evaluated nor well used in modern times." He believes the distrust of this primitive remedy may be explained by "a lack of knowledge and understanding of sound, rhythm and music in all respects on the part of the physician, as well as the musician." If rhythm and music produced results in savages, it is "not unreasonable to believe that such modalities may help to produce equally unusual results in patients in hospitals." He also gives practical suggestions on the type of planning necessary for a hospital concert.

At the end of the second World War more of the
music work was taken over by the Veterans Administration, which has placed the Music Division under the Recreation and Entertainment Service. Green (1947), chief of the Music Division, has described the music program in Veterans Administration hospitals as follows:

The organization of the Music Division is on three levels: Central Office, Branch Office, and field or hospital. . . . In addition to the eleven domiciliary Homes, there are at the present time 122 hospitals of three general types: (1) General Medical, (2) Tuberculosis, (3) Neuropsychiatric. Patients are classified according to the type of hospital. A program of music activities has been planned that will offer a broad, well-rounded selection of activities in which all patients may participate in some way, either actively or passively.

The program is divided into music recreation, music entertainment, and music recreational instruction.

Music activities specifically requested by medical authority in Veterans Administration Hospitals have been added to the foregoing activities as an integral part of the program of the Music Division. In addition to music activities operated for purposes of recreation and entertainment, special music activity designed for an individual patient also may be specifically requested by the attending physician.

The Chief of Special Services is responsible for scheduling and directing the music-activity program at a Veterans Administration hospital, in both its active and passive phases, in close coordination with medical authority. Music technicians . . . have been selected for their qualifications in the field of applied music and for their ability to organize and stimulate group and individual music participation.
Burris-Meyer and Cardinell (1946) investigated the application of music in medical practice and reported that these trials "tended to show, almost without exception, what most people believed anyway, that music is a tool of considerable effectiveness for alleviating many of the ills which are in the province of psychiatry."

In addition to Altshuler's work, they mention the following experiments:

A musician and a group of psychiatrists have collaborated in one hospital to use music to stimulate or relax or awaken an interest in convalescents for whom such treatment was indicated. . . . Apparent benefits have been validated against controls in a considerable number of cases. A speed-up in convalescence on the part of patients attending music sessions as opposed to their controls, is indicated. . . .

In one hospital there are two wards of considerable size filled with psychoneurotic patients. The amounts of drugs used to get the patients to sleep were fairly consistent and similar for the two wards. Recorded slumber music was introduced into one ward and not into the other, whereupon the amount of drugs used in the ward where music was played fell off appreciably, while in the other it remained constant.

One physician has reported that, since installing music in his waiting room, he has found the average time taken to process a patient reduced by approximately one-half.

In a more recent paper on music as an aid to healing, presented at a meeting of the Acoustical Society of America, Lewis, Burris-Meyer, and Cardinell (1947) stated:
Though surveys of current practice do not answer the question of what music will do to people who are ill, they at least show who is doing what. One survey is being undertaken on a national level by a special agency of the War Department. The Veterans Administration operates a planned, coordinated music activity. The following items from a recent report on the use of music with patients in V.A. hospitals may serve to indicate the way the wind is blowing:

(1) Music activities encouraging patient participation are carried on in practically all V.A. hospitals and convalescent facilities. Approximately thirty percent of such activities are directed by trained musicians.

(2) In December 1946, 4500 musical performances were given within their facilities by outside musical groups.

(3) Of over 80,000 patients participating in musical activities, one in ten became a participant on the specific recommendation of medical authority.

(4) Of 1400 patients receiving instruction in the playing of one of various instruments, nearly one-half had been recommended by doctors to receive that instruction.

The figures, they add, merely show the extent to which music is used and do not indicate whether this use has any other than recreational value. Medical authorities such as General Kirk, Admiral Swanson, and General Hawley do not sanction the use of the terms "music therapy" or "musical therapist." They insist that music be classified among those measures that may aid morale. General Marietta (1945) also places music in this category.

Information concerning Veterans Administration music activities is from reports of the Music Division (Ray B. Green, Director), Recreation and Entertainment Service in Special Services. [Note in original text.]
These authors also report that, although facilities for controlled experiments are not abundant, "hospital authorities seem increasingly disposed to sponsor objective investigations of the use of music."

(a) A project is planned for a midwestern hospital in which controlled background music will be distributed generally through dayrooms in a mental hospital. An effort will be made to keep other conditions uniform and estimate the value of the music on the basis of possible variations in the normal discharge rate.

(b) A musical program was played for several months at reveille time in a disturbed ward in a mental hospital. During that period the accident rate (contusions, abrasions, and furniture breakage) diminished measurably.

(c) Several of the mental hospitals are exploring the use of music with their patients before and after insulin and/or electric shock treatment, and in the neutral cold-pack room during the treatment of the patients. Careful records kept of the nature, duration, and intensity of the music, and variations in patient activity in one series of electric shock tests, are now being analyzed.

(d) A report is soon to be issued concerning the use of music as an element in anesthesia. . . . [See p. 160]

Other phases of musical activity are currently being studied in some hospitals of the Armed Services and the Veterans Administration, and elsewhere.

In a program at the Veterans Administration Hospital, Oklahoma City, the following specific objectives were set up to be accomplished with music, especially played and selected for the tubercular and cardiac patients: (1) To pro-
vide a passive type of activity which will cut down physical exercise and exertion and prevent restlessness. (2) To aid in substituting constructive thoughts for destructive thoughts by offering music conducive to produce courage, energy and peace. (3) To assist in adjustment to long term hospitalization by providing interest in cultural activities. (4) As a possible real release from pain, by providing a means of relaxation and sedation, and by relieving tension. The patients are casually observed and some notations are made in an effort to determine the extent of therapy (Bates, C. E., personal communication, 1947).

A project has just been set up at Winter Veterans Administration Hospital "to evaluate two factors related to the use of music in therapy, namely, does selected music have a sedative effect on patient and can a selected musical program for a ward be used over a period of time to influence the general mood swings and behavior pattern of the patient?" (Karl A. Menninger, personal communication, 1947).

An exploratory project (at the Veterans Administration Hospital, Canandaigua, New York) was carried on over a period of six and a half months for the purpose of assaying the effect of music in connection with neutral wet pack treatment. Twenty-six patients, most of them psychotic, were observed, and a daily record was kept showing the music played, each patient's overt behavior, and the noise level of the group. The worker states that "no definite pattern of response to music played during pack treatment was determined. . . . Due to innumera-
ble stimuli acting on a patient, his behavior during a given exposure to music can not be attributed to the music” (Arlene Schoenberg, personal communication, 1947).

On the basis of the findings published by the National Music Council in 1944 (see p. 115), other programs have been set up by various groups such as the American Red Cross, the National Federation of Music Clubs, the American Federation of Musicians, the Musicians Emergency Fund, and so on, to aid both the amateur and the professional musician. The Bulletin of the National Music Council carries a section devoted to “Music in Therapy,” the annual Proceedings of the Music Teachers National Association cover the topic of “The Functional Use of Music,” and other organizations have similar discussions.

Because many musicians who have expressed a desire to be of service are unfamiliar with the purpose and needs of the institutions, van de Wall published a monograph in 1946 in which he gives a general outline of organization and functions of the various departments in a hospital in relation to the patient. It provides a review of the place of music in everyday living and the special applications of a music program in institutions. Equally valuable are the discussions of the way in which the music program may be integrated into the hospital service to the best advantage and of the qualifications required in a hospital musician. “The better the musician and the other members of the staff understand his work as an organic part of the collective effort, the more the patient, who is
the center of all measures taken, will benefit from its musical phases” (p. 65). To achieve this aim, the musician will need to collaborate with the medical and nursing service, the occupational therapy and social service departments, the chaplain’s service, the women’s auxiliary, and the business office. The amount and the type of music in any institution will be conditioned by the amount of professional interest, ability, and serious collective effort of all the staff members.

Suggestions are also given for the organization and administration of the music service, for suitable periods of programming and the keeping of records and reports, as well as for other practical information the musician may require.

For amateur musicians who volunteer their services for the first time, van de Wall (1946, p. 59) suggests that attention to the following details will help to establish rapport between the entertainer and the patients.

1. Every program should be carefully planned, practiced, and rehearsed.
2. Every number of the program should be presented in a convincing style, free of stumbling over notes and words, and wobbly intonations, poor tone quality, and inaccurate harmonies. The entertainer should be able to give an easily flowing performance, pleasant to hear and comfortable to watch. He should do more than merely produce tones and vowels; he should transmit coherent and lucid messages of musical and poetic beauty.
3. The program should include only compositions that lie well within the singers’ vocal range and require no more vocal
or instrumental technique than the performers command.

4. No compositions of pretentious length or extraordinary complexity should be presented. Selections should be varied in style, short, and appealing by their straightforward simplicity.

5. Musical ensembles, trios, quartets, and larger groups should be carefully planned and rehearsed so that no disturbing incidents will occur.

6. Programs should be given according to schedule, beginning and ending exactly at the hours agreed upon.

7. On formal occasions a few well-chosen words introducing the performers, the titles of the selections, and the names of composers and lyricists are polite, and an appealing method of enlightening the audience and obtaining its eager attention.

8. At ward entertainments...a certain informality and casualness will often be preferable.

9. Entertainers should be tastefully groomed and deport themselves in a businesslike manner.

10. Applause should not be expected as a matter of course, but, when forthcoming, should be cordially acknowledged.

11. When a certain selection does not meet with a favorable reception, the performers should not be perturbed but keep going in the best of spirits.

The activities among professional groups reveal two types of programs. One is the establishment of courses at universities and music schools for the training of those who may be interested in the study of music in relation to therapy; the other is the formation of committees to study research possibilities and the qualifications of personnel. It will be noted (p. 153) that in the Surgeon General's out-
line of a music program the qualifications of teaching personnel were also given prominence.

Courses of varying length were given at the University of Southern California, Hunter College, Western State Teachers College, and elsewhere. At New York University, the Department of Music Education in the summer of 1945 set up a three-week course in music therapy with the assistance of members of the Department of Psychiatry. Included in the course were such topics as “Physiologic and Psychologic Effects of Music,” “Mental Hygiene and Introduction to Psychiatry,” “Principles of Psychotherapy,” “Problems of Rehabilitation,” “Musical Techniques in Therapy,” “Case Work in Music Therapy,” “Organization and Direction of Music Activities in Institutions.”

Licht (1946) also suggests an outline for a projected curriculum that would combine music with instruction in certain subjects related to medicine, such as physiology, kinesiology, occupational therapy, and so forth.

A more ambitious program has been set up at Michigan State College, where a four-year course was outlined to cover the curriculum for a music therapy major (National Music Council Bulletin, Jan., 1945, p. 8).

A report by the Music Education Curriculum Committee for 1945 mentions the fact that the University of Minnesota sponsored two institutes on industrial music at the Center for Continuation Study and that these insti-
Michigan State College Course

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<tr>
<th>First Year</th>
<th>Credits</th>
<th>Third Year</th>
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<tr>
<td>Written and Spoken English</td>
<td>9</td>
<td>History of Civilization</td>
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<td>Biological Science</td>
<td>9</td>
<td>Piano</td>
<td>12</td>
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<td>Voice</td>
<td>6</td>
<td>History of Music</td>
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<td>Piano</td>
<td>6</td>
<td>Class Instruments</td>
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<td>Theory</td>
<td>12</td>
<td>Introduction to Social Psychology</td>
<td>3</td>
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<td>Minor Instrument</td>
<td>6</td>
<td>Social Organization and Disorganization</td>
<td>3</td>
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<td>Physical Education (for Women)</td>
<td>3</td>
<td>Child Psychology</td>
<td>3</td>
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<td>Military Science (Men)</td>
<td>4½</td>
<td>Mental Hygiene and Social Work</td>
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<td>Choral Organization</td>
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<td>Abnormal Psychology</td>
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<td>Literature and Fine Arts</td>
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<td>Elementary Statistics</td>
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<td>Effective Living</td>
<td>9</td>
<td>Social Attitudes</td>
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<td>Piano</td>
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<td>Experimental Psychology</td>
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<td>Theory</td>
<td>6</td>
<td>Piano</td>
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<tr>
<td>Physical Education (Women)</td>
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<td>Composition</td>
<td>4</td>
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<tr>
<td>Military Science (Men)</td>
<td>4½</td>
<td>Minor Instrument</td>
<td>4</td>
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<tr>
<td>Principles of Sociology</td>
<td>4</td>
<td>Folk and Social Dancing</td>
<td>2</td>
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<tr>
<td>General Psychology</td>
<td>4</td>
<td>Human Heredity</td>
<td>3</td>
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<tr>
<td>Philosophy and Psychology of Art</td>
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<td>Final quarter to consist of internship in a neuro-psychiatric hospital.</td>
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<tr>
<td>Choral Organization</td>
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Institutes were attended by manufacturers of equipment, production managers, program operators, music producers, business manufacturers, personnel managers, professors, business people, and military personnel.

In August, 1947 a three-day institute of functional music, in which various professional groups participated, was held at the University of Wisconsin.
At the first meeting of the Committee on the Use of Music in Hospitals (National Music Council, 1946), attended by physicians, psychiatrists, musicians, and music educators, it was emphasized that music in hospitals is more than recreation, but that its precise value must be determined by scientific research and tests. It was agreed that means should be found whereby medical and musical authorities will promote such research and that the work of this committee should be correlated with that of the Committee on the Functional Use of Music in Hospitals of the Music Educators National Conference.

The Music Committee of the Acoustical Society of America is working in co-operation with the American Musicological Society to effect reciprocal exchange of views on the scientific aspects of functional music. Their primary objective at present is the establishment of precise and universally applicable terminology.

Fletcher (1947) has suggested the establishment of an Institute of Musical Science for the experimental investigation of cultural, educational, and psychological uses of music and the development of musical instruments.
Even the severest critics of music therapy are willing to concede that studying music is for some patients more than a pastime and that for the musically trained patient music making may be a big factor in rehabilitation.

Several publications on the use of music in hospitals, discussed elsewhere, refer to its application as a form of occupational therapy. Those mentioned below, however, emphasize occupational or physical therapy—playing of musical instruments for the purpose of providing specific exercises to restore some impaired function.

The new prospectus of the journal, Occupational Therapy and Rehabilitation (February, 1947 issue), now under the editorship of a physician, gives concrete expression to the trend of occupational therapy away from the vocational and "inspirational" approach to that of physical reconstruction and clinical research.

The main objectives of occupational therapy have been classified as kinetic (functional—used to restore muscle strength, joint mobilization, and co-ordination), metric (graded), tonic (diversional), and psychiatric. To attain these objectives it is proposed to develop the fol-
following general activities: agriculture, the arts (including music), the crafts, education, industry and maintenance, and recreational therapy. The editor (Dr. Sidney Licht) remarks that "music therapy as a description of treatment has not gained acceptance among most physicians except when used as Kinetic Occupational Therapy."

In January, 1945 the name of the periodical *Archives of Physical Therapy* was changed to *Archives of Physical Medicine*, in conformity with these trends. It is more essential than ever, therefore, that in this work there be close co-operation between musician and physician, for to be effective as an aid in reconstruction, the musical activities must be subordinated to the clinical goal. On the other hand, although exercising the hand or the fingers by playing an instrument may be more pleasant than repeated flexion and extension unrelated to any other activity, if the musical skill required is beyond the patient's aptitude it may have a bad psychological effect.

The mechanics and physiology involved in playing have not been reported extensively in this country, but references to literature on this topic are to be found in a few publications.

Von Schroetter (1928) has studied the amount of energy expended in mandolin playing. Ortmann's book (1929) on the biodynamics of piano playing and Bernstein and Popowa's briefer study on the same subject (1929) both provide an analysis of the mechanics involved and the movements of the hand, arm, and shoulder
muscles. Korber (1943) lists the muscles employed in piano playing, giving the origin, attachment, and simple function of each. Roos (1936, 1938) discusses the physiology of playing the flute and mentions other instruments. He also cites additional material related to the subject of muscular movement. Friedrichs (1933) and Frucht (1937) have reported their observations on the playing of wind instruments from the medical point of view. Strayer (1939) discusses the use of wind instruments classes A, B, C, D, and describes the mouthpiece and the embouchure. He names the muscles involved in playing each type of instrument and the indications and contra-indications, but his main concern is with malocclusion of otherwise normal dentures. Woodward (1941), Joyce (1941), and Cheney and Hughes (1946) have also written on the subject of dento-facial irregularities in relation to music-making.

Gardner (1944) found that playing some instrument was of great value for patients seeking to recover the use of their hands. The most popular instruments were the piano, the violin, and the oboe. This training also helped to find jobs as musicians for some of the handicapped. But he gives no further data on this matter. Fultz (1944) has shown how the various instruments may be utilized for certain objectives in physical therapy (see p. 150).

1 A Little Night Music, by Johnson (1937), is an amusing and sprightly little book describing his adventures in flute playing that might be enjoyed by a patient struggling with his own musical problem.
Licht (1946), in his chapter on “Music as Occupational Therapy,” describes the use of musical instruments in restoring the functions of various joints and muscles, and he lists the type of motion possible with each.

Additional information on the relation between certain musical instruments and the musculature involved in their use may be gleaned from the literature on occupational diseases of musicians (see Singer, 1932; Sear, 1942).

Music therapy on a small scale became an adjunct of occupational therapy in the first World War, when the American Occupational Therapy Association was organized in 1917. But occupational therapy as it is known today was a new concept in the army, the term itself having been used only since 1914.²

The place of music in occupational therapy during that period can be gauged from the fact that in the United States Surgeon General’s history of the Medical Department (1927) the only references to music are the following:

² When Haas published an article, in 1924, entitled “One Hundred Years of Occupational Therapy,” he discussed recreation and occupations, but did not mention music. In the statistical report of the physical education departments for 1922 there are listed some 23 games and sports, including dancing, and in the statistical report of occupational departments there are about 35 types of jobs, ranging from “blacksmithing” to “water color and oil painting,” but no music. Curiously enough, Dunton’s survey, in 1944, of “Some Older Occupational Therapy Literature” revealed that the first reference (1846) to this form of therapy in the treatment of mental conditions concerned the use of music.
The American Red Cross was to be responsible for entertainment and recreation . . . and . . . to arrange for and equip bands and orchestras. . . . Recreational activities proved so popular in hospitals that it was sometimes necessary to curtail organizational programs in order to allow time for patients to participate in the educational work.

In the volume on neuropsychiatric work (1929) appears this statement: "A band was organized. . . . Frequent entertainments . . . were given."

But its use for this purpose developed in time. Under the legal provisions of the Veterans' Bureau in 1922 occupational therapy was to "include any occupation, mental or physical, definitely prescribed and guided for the distinct purpose of contributing to and hastening recovery from disease or injury," (Kefauver, 1926) and several administrators of veterans' facilities introduced music as a function of the occupational therapy department.

Other hospitals used music in the same manner. Davis (1928) suggested community singing and band, orchestral, and other ensemble practice as forms of occupational therapy for those musically inclined. Steele (1929) reported that the hospital orchestra was managed as an occupational therapy project, with an aide in charge and an instructor from outside giving assistance two hours weekly. Individual instruction was also introduced for this purpose.

Some administrators made special use of music for specific disorders, such as speech defects. Larson (1928)
reported that some persons who had become mute from the effects of shell shock regained their speech at concerts by joining in the chorus of some well-known song. People who stammered or stuttered in ordinary conversation were able to sing without showing such a defect. He also cites the case of a soldier who lost the function of speech after receiving a bullet injury of the brain, but was able to sing the words of a song if the first bar were sounded for him. Inarticulate sounds are initiated in both halves of the brain, while for right-handed people speech can only be initiated in the left side. Through the practice of songs this soldier learned to speak again. Larson concluded that the song ("Tipperary") had been repeated so many times that it had become organized in both halves of the brain or in the subcortical lower centers.

Gardner (1944), a British writer, corroborates these observations and states that training the patients to hum a rhythmic tune helped to restore speech. Similar results have been reported by Sheehan (1946).

Hudson and Fish (1944), in their book on the use of occupational therapy in the treatment of tuberculous patients, devote an entire chapter to the place of music in the hospital. They present a common-sense approach to the problem of interesting the patient in music as a recreation and suggest practical methods, based on experience, of introducing certain types of music, obtaining information from the patients as to their interests and preferences, using records and radio programs, instrumental
and vocal music, explaining their relation to each other, the time for outside music, the therapist's duties in the music program, and similar topics. The authors emphasize that for this type of patient a program of passive participation rather than the pursuit of music-making is to be preferred. To this end they advocate such activities as music appreciation and informal study of biography and literature about music. The use of records is more important for the tuberculous patient than for others, because it provides him with a source of enjoyment in which he can continue his interest after he has left the sanatorium. Their bibliography includes several books on recordings.

Licht (1946) also discusses various kinds of music libraries and the uses to which these may be put. He suggests types of music and recordings to be kept and books suitable for reference purposes and for the patients.

In the *Occupational Therapy Manual* (1943), prepared jointly by the American Medical Association, the Occupational Therapy Association, and the National Research Council for use during the war, appear the following statements.

"An occupational therapy section is established in an Army or Navy general hospital to provide functional and psychologic activity. It is prescribed for the purpose of hastening improvement or recovery from disease or injury."

Kindwall and McLean are quoted to the effect that:
Experience seems to show that even in the neurotic, mal-adjusted person the element of imitation or suggestibility, or herd-instinct, or identification, or whatever one may call the phenomenon, is not entirely dead, and that there is something contagious in the example of a group of people working for group purposes, when there is a need to be met. . . . Once the patient has been seduced by circumstances into manual activity of a socially useful kind, he will have taken a first unobtrusive, tentative step toward increased solidarity with the group. And that is the direction toward which are aimed all psychotherapeutic measures, whatever may be their technique and whatever they are called (p. 54).

The editors add: “The importance of music as an aid in the adjustment and cure of neuropsychiatric patients cannot be too highly stressed.” ³ The bases for this statement are the opinions of several writers previously cited in this survey.

But the position of the American Medical Association is more fully discussed in an article by Fultz (1944), in which he writes:

Musical activity is accepted by the American Medical Association as a constituent part of occupational therapy. It is included in the required curriculum of an approved school of occupational therapy under the heading of “Recreation,” along with dramatics, social activities, gardening and physical recreation. Since music is a fine art, it is also proper to consider it as part of the category of “Therapeutic Arts and

³ In the 1947 edition of the Manual this statement has been revised to read: “The importance of music as an aid in the adjustment and cure of neuropsychiatric patients is great, although much research is still called for in this field.”
Crafts.” Thus music belongs in two entirely different divisions of occupational therapy.

He suggests that musicians be given occupational therapy training, because there is a scarcity of professional occupational therapists to supervise their work with the patients.

Fultz mentions the following specific purposes for which music may be useful.

**Orthopedic patients** [also neurologic patients]: The complex co-ordination of movements of musical activities should be analyzed for each specific application in terms of orthopedic principles. “Primary variations include the position of the patient in relation to the instrument and the particular movements needed in playing it.” He cites a few cases in which melody was arranged so that the affected hand could carry the melody, since all instruments in common use, except percussion instruments, require finger movements. If the patient knows nothing about music, a tonette or recorder might be used. Most musical instruments can be used for rehabilitation of wrist or elbow, except (for left hand) the violin, the mandolin, the Spanish guitar, the horn, and some of the woodwinds. The movement of either wrist or elbow can be intensified by immobilizing the other if certain instruments are employed. A drum, a concertina, cymbals, or a trombone can be employed for movements of the shoulder. Pedaling or playing specially constructed keyboards similar to the pedal keyboard of an organ can be
used to improve the movement of the lower extremities. Muscle power, digital dexterity, and co-ordinated organization of movements rather than perfection of musical expression should be stressed in orthopedic cases.

For patients with *cardiac* disease, the following music-making devices have proved practical in a hospital where rheumatic fever cases are studied: dulcitone, a keyboard instrument struck by hammers (portable); tonette, flute-like instrument; glasses; reed organ, "Liberty" pipeless, pipe-tone portable organ.

For patients with *pulmonary tuberculosis*, any music-making which does not overtax the lungs would provide practical avocational and cultural development, and slightly improve the muscle tone.

For *psychiatric patients*: "Since one is able to measure the effect of music on a patient's mood with fairly uniform accuracy, it is possible to select certain psychiatric patients in whom musical experiences can be depended on to create a zone of normality" from which to extend operations to other affected parts of the personality and for rapport. In some instances, the mood of a patient was used to enhance his performance; he was then helped to transfer this musical discipline of emotion to other phases of adjustment. "The use of music as a modality of occupational therapy is most nearly ideal when the patient is not too conscious that therapy is being administered."

Resistance to selected muscular movements may be increased by (1) increasing the tension which a given move-
ment must overcome and (2) varying the frequency of motion.

Tonettes and recorders require the least finger pressures. Eight ounces (240 GM.) of pressure will produce a good tone on most pianos. Hammond organs require a lighter touch and can be adjusted. Fretted instruments, such as ukuleles, Spanish guitars, mandolins and banjos, require pressure ranging up to 4 or 5 pounds (1.8 to 2.3 KG.) per finger, while a cellist may use from 1 to 15 or 18 pounds (0.5 to 6.8 or 8.2 KG.) per finger. The cello is the easiest of the stringed instruments to play.

Where the purpose was to achieve better function of wrist, elbow, shoulder, ankle, or knee, the limitation of instruments sometimes made it necessary to vary the resistance by attaching weights at appropriate points.

Fultz has also designed a small portable instrument called the Clinic Organ, which has been distributed to several hospitals throughout the country. The instrument has been described by Davison (1946) as follows.

The Clinic Organ is in reality a tiny pipe organ on wheels. It contains 81 real organ pipes in two ranks. Its console, with a range of 42 keys, weighs five pounds and is attached to the organ by a 30-foot cable. It is easily held on a patient's lap or laid on his bed-table, where he can play it with the least possible inconvenience. The console has adjustable, orthopedic key tensions. It is especially useful in the rehabilitation of tendons and muscles of hands and forearms. The intimate quality of the tone of this instrument is particularly valuable, further than the orthopedic applications mentioned above, in certain psychiatric problems.
Other instruments serving a similar purpose have been mentioned in the press, namely, the "xylette," developed by Harold E. Rhodes in 1944, and the "theripiano," by Ross and Armstrong in 1947.

During the second World War the Armed Services also showed greater interest in the possibilities of musical therapy in the occupational therapy department. The following program of the Surgeon General's Office, established in 1944, is an indication of the extent of this interest. (National Music Council Bulletin, Jan., 1945.)

1. Objective—The objective of music in reconditioning is to integrate music with the four main reconditioning activities, namely, physical training, education and orientation, occupational therapy, and diversional activities.

2. Personnel
   a. At least two music technicians, enlisted men of the hospital detachment, are necessary in each General Hospital. They function under the Reconditioning Education Officer.
   b. The success of the program lies largely in the vision, initiative, adjustability, cooperation, willingness and musicianship of the personnel assigned to music. Care is taken in finding the right men for this work.

3. Program
   a. Participation by Surgical and Medical Patients
      Music workshop, orchestra, small instruments, group singing, chorus, music with calisthenics
   b. Listening by Surgical and Medical Patients
      A room for music appreciation, records, library, balanced recorded programs over public address sys-
tem, contact with symphony orchestras, etc. (Participation is prescribed by medical officer.)

4. Neuro-Psychiatric Section
   a. Participation
   b. Listening

5. Participation by all patients
6. Orientation lectures
7. Library
8. Advertising of musical activities (to patients)
9. Recreational music for persons free from medical treatment

A ten-page bulletin issued by the War Department in 1945 (TB Med 187) gives an outline of the plans for the use of music in reconditioning in army service forces convalescent and general hospitals. There is also a chart showing the interrelationships of the departments of physical reconditioning, occupational therapy, education, and recreation and the musical activities carried on by each. For instance, physical reconditioning uses music with calisthenics, individual instrument playing, orthopedic orchestra; occupational therapy supervises the making of instrument assembly kits and improvised instruments; education encompasses individual or group music instruction, music appreciation lectures, music supplementing films and talks, available music courses, creative music, recitals with commentaries, and selected radio programs; singing (glee and chorus), record concerts and request programs, quiz and variety shows, and band music come under the recreation department.
There are suggestions for organizing the various activities and the materials that go to make up a successful audio-reception program.

On the subject of music preferences there appears the following statement:

All patients are not reached by one type of music, but the majority of them have a liking for the "sweet dance" type which is predominantly melody and harmony with subdued rhythm and moderate tempo. Tone quality, pitch, intensity, and rhythm are all fundamentals which contribute directly and indirectly to the effects of music on the participant or listener. Preferences in music can play an important part in influencing mental and emotional trends. There should be no attempt to influence preferences unless it is definitely determined that a certain type of music is detrimental to a certain patient. Observations have shown the following order of preference: Sweet dance, popular and current vocal, including "swing," semiclassical, classical, devotional.

Musical instruments and other equipment furnished to the Special Service Division, such as song sheets, instructions for instrument making, etc., are also described. There is a list of about a dozen other War Department releases, the majority of which were issued 1944-45, which "are considered basic." They are mentioned by number only, and titles are not given.

A footnote to page 1 of this bulletin reads: "The Office of the Surgeon General cannot consider music a therapeutic agent until further scientifically controlled tests have proved its value as therapy."
During this period (1944), by order of the chief of the Music Section in the Special Services Division, Marriner conducted an investigation in many service hospitals in various parts of the country, to learn the possibilities of music as a therapeutic agent, as well as the type of music that the men enjoyed. Many of the patients had little knowledge of music. He found, however, that the men who had been in battle preferred quiet, soothing music.

Marriner's experiences convinced him that there is as much danger of the wrong use of music as there is good in its proper application [Music for Rehabilitation of War Casualties, 1944 (an interview)].

Musical malpractice can arise when the playing of instruments by neuropsychiatric patients is not controlled by medical officers or trained technicians. . . . The music that a neuropsychiatric patient wants and plays is not always good for him. Being unstable, he indulges his instability by strumming hour after hour on an instrument, or by listening to melodies or rhythms which, owing to his condition, he would do well to avoid. . . . The prescription of music should, without question, be under medical direction and control.

It was his opinion that the army's reconditioning program should be compulsory; that a patient's whim should not necessarily be decisive, especially with music, although some latitude should be allowed for a man's tastes and inclinations; that the fundamentals of music exert their
influence by virtue of their individual properties, and also contribute to the total effect.

In a later report (Marriner, 1945) he states that a six-month survey proved there was a place for music in reconditioning to be used educationally, and a well-organized music program could be a motivating element in hospital life, when integrated with the many other activities. The survey showed that music could be utilized in many advantageous ways.

Firstly, in physical reconditioning, music could be carefully synchronized with each exercise for the various classes of patients. The tunes undoubtedly gave a psychological boost to the participants.

Secondly, many patients fond of music, could play simple instruments as a physical modality in post-operative exercise if they were orthopedic or plastic cases, and there would also be value in the blowing of wind instruments for lung cases.

Thirdly, in the educational activities, many patients wanted to study music, notation, some kind of instrument, play an orchestra, play chamber music or sing in a chorus. . . . Talks and demonstrations of the various phases of the art of music would also meet a need in the lives of many patients.

Fourthly, there was a great need for resocialization, or what may be defined as a self-realization of one's relationship to other people. . . .

Fifthly, in neuropsychiatric treatments sections, it was found that a well-rounded program of music activities, with special applications when and where required, was needed.

A music program for this type of patient did not neces-
sarily mean it was “Music Therapy.” . . . The emotional values of music are not to be confused with their effects upon hearers, as probably no two listeners listen to or absorb music the same way. Many people assume that the emotional reactions to music are evidences of the therapeutic value of music. Until doctors, psychiatrists, psychologists and musicians have made scientific clinical tests over a period of several years, and have proven music to have definite curative powers, the medical profession will not accept the term “Musical Therapy.”

Exploratory programs of music for reconditioning are currently being continued in various hospitals, as was noted in the preceding chapters. In rehabilitation work, which in accordance with present concepts has its inception with the beginning of clinical treatment, the services of several departments are pooled in the work of getting the patient to achieve physical, mental, and social recovery.

This practice has been further extended in the Veterans Administration through the integrated programs of combined research and training inaugurated by General Omar N. Bradley and Major General Paul R. Hawley. One example of co-ordination under this plan is to be found in the description of the Menninger Foundation Schools of Psychology and Psychiatry (1947) and their relation to the Winter Veterans Administration Hospital. See also the general discussion of the place of physical medicine and rehabilitation in the Veterans Administration (Covalt, 1947).
Similarly, music as a therapeutic agent and required training for music therapy are not isolated activities, but can be studied to best advantage in a program of broadened interrelationships.
CHAPTER VIII

MUSIC AND ANESTHESIA

When the phonograph was introduced into the general hospital wards, it was noted that records of music and dramas not only entertained the patients but also helped to relax them so that they ate and slept better and their convalescence progressed more favorably.

It occurred to a few doctors that this instrument could also be employed to advantage as a psychological aid for the patient about to go into the operating room. At first this was considered merely a pleasant distraction to allay the patient's anxiety regarding the outcome of the operation, but it was soon found that as he relaxed while listening to the music, he could be anesthetized more easily and did not require the same amount of medication. This led to the use of music as a direct aid to anesthesia. It has even been asserted that a few patients were so soothed by music that they elected to do away entirely with anesthesia for some minor surgical procedure.

This application of music, at a time when the term "music therapy" was coming into general use in connection with the veterans' hospitals during the first World War, made a dramatic appeal to the lay public, and there are many more reports about it in the press and popular
journals than in medical periodicals. However, a few articles concerning the use of music as “psychic anesthesia” are to be found in scientific publications.

Among the first reports of that period is a letter from a surgeon, Evan O’Neill Kane (1914), published in the Journal of the American Medical Association, in which he related that he had for some time been using a phonograph in the operating room. “The phonograph talks, sings or plays on, no matter how anxious, busy or abstracted the surgeon, anesthetist and assistant may be, and fills the ears of the perturbed patient with agreeable sounds and his mind with other thoughts than that of his present danger.”

Burdick (1916), the anesthetist at the same hospital, published a fuller account following a year’s experience with patients who had been permitted to listen to records of their choice when they were being anesthetized. He was in the habit of visiting the patient the night before the operation and reassuring him, saying, “We look upon [the procedure] with such cheerfulness that we frequently have a little music while operating.” When the patient was brought into the operating room, he could hear the muffled phonograph from the anteroom playing his favorite music, and it helped to dispel the “operating room atmosphere.” Temperament, education, religious training, and other psychic factors, as well as degree of fondness for music, were considered in selecting the records.
When local anesthesia was used the music was played during the operation. When a general anesthetic was administered, the music was sometimes resumed just as consciousness returned, and this helped to reduce the severity of the after-effects. Most patients were favorably impressed, Burdick stated, and those who disliked music “make known their indifference to its charms so promptly, and with such emphasis, that there is no difficulty in discovering their deficiency in this respect, and the concert is brought immediately to a close.”

Mays (1917) reported the use of music as an anodyne by a friend who had been suffering for a month from a severe neuritis of the arm and shoulder. When his daughter one day played the piano, he noted that some of the music made the pain worse, “while some other kind had a soothing and quieting influence on him and brought about a feeling of sleepiness and repose. . . . It was soon learned that the disagreeable effects were caused by major music and that the grateful and sedative results were occasioned by music set in minor keys.”

Mays’s explanation was that

the nerve which was at fault here was irritable and excited, was subject to a condition of hypersensibility, similar to that which obtains in a strychninized frog just below the border where a spasm is liable to be produced by the slightest provocation, and that relief of any kind would have to come in the form of something which had the power of subduing and calming this undue agitation. This could have been effected,
at least temporarily, by a hypodermic injection of morphine . . . but music in minor notes, which likewise possesses a depressing and quieting influence, was capable of accomplishing the same without the aid of ordinary medication.

Gatewood (1921A), who did considerable work on the psychology of music (see p. 66), suggested at a meeting of anesthetists that in light of the foregoing observations, the practical use of music in connection with anesthesia be given further scientific study.

Although there are four definitely defined stages of ether anesthesia . . . the situation is not wholly unlike that of normal sleep. . . . A stimulus which in waking life is pleasant seldom produces nightmares. . . . It certainly seems logical therefore to make the last waking stimuli as pleasant and as quieting as possible.

She advances the theory that

If the attention of the individual be sufficiently centered on one stimulus or group of stimuli, it may keep out all others. It is a neurological fact that two stimuli passing centrally at the same time tend to neutralize each other, the stronger more persistent one coming into consciousness. According to Meyer's principle of induction (a similar theory is advanced by Sherrington) the nervous process already stimulated along one pathway tends to draw into its channel the processes established in adjoining neural pathways, thus increasing the intensity of the original excitation. Accordingly if we succeed in getting pleasant stimulation started first, it is more apt to dominate and later stimulation loses its own appropriate meaning in the flow of the original neural process.
McGlinn (1930), an obstetrician, reported that a number of hospitals had added radio to their operating room equipment to be used as an adjuvant to local anesthesia in tonsil operations on children, and that Donald Guthrie supplied music both before and after administration of ethylene anesthesia.

He himself had used music for about a year, constructing an automatic record-changer for the purpose, and had found that it reduced the possibility of complete loss of consciousness during spinal anesthesia. It was especially desirable in these cases because under spinal anesthesia the hearing is very acute, and the music masked the noises in the room. At the same time, it did not interfere with the rigid operating room technique, and its motif could be changed to suit the tastes of the patient. McGlinn writes:

When we first started using music we thought of it only in connection with local and spinal anesthesia. We now recognize its value in: A. Creating a better atmosphere for all patients coming to the operating suite. Patients are greeted with music and the usual noises of the operating room are not heard. B. Diverting the attention of patients in operations under local and spinal anesthesia. . . . We have had a few patients, in a fairly large series, object to the music. These were of the highly hysterical type and who were not really suited to spinal anesthesia. The majority of the patients enjoy the music and it is not an unusual experience to hear them humming a familiar tune. I have heard a patient singing loudly while a forceps extraction was being done. There is
no question that the patients are better for the lack of psychic shock and lessened pre-anesthetic drugging. C. Relaxing the tension of the operator and operating room personnel during operations. D. Entertaining the operating suite force during the arduous task of cleaning up, and preparations, after the work of the day is finished.

We nearly wrecked the study in its incipiency by trying to adapt the type of music to the character of the individual. [Jazz] had no place in the operating room. Sentimental music must also be avoided. We found that soft, soothing melodious music is the kind most acceptable to all patients.

DeLee, in discussing this paper, said that he had had considerable experience with music as an aid in local anesthesia, when he tried to convert the patients to the idea of permitting local anesthesia and to help them see that the operating-room procedure was "practically painless."

Erdmann (see "Music Aids the Anesthetist," 1933) made considerable use of music, but did not report on it. However, an item in one periodical states that he considered the results favorable. He discarded the radio in favor of the phonograph with earphones attached, because the program could then be controlled. The music made no demands on the patient and yet distracted his attention.

Best (1935), a dentist, described a "radio-chair" that he had devised, by means of which he was able to supply music to his patients during treatment. In that article he discussed the physiology and psychology of pain, but
his experiment with music was too recent to warrant definite conclusions.

Rusca (1935), in a paper relating his experience with the anesthetic agents tunocain and percan in 2,400 cases of spinal anesthesia, makes brief mention of the fact that for several months he had introduced a radio-phonograph into the operating room. As soon as the patient was placed on the operating table he was fitted with a set of earphones. In this manner the patient was, so to speak, isolated from the operating room, and he was conscious only of the music, which had been chosen to suit his tastes and wishes. Not only was the operation painless, but it became associated with a pleasurable experience.

Kirschner (1936) used music with local and general anesthesia for all sorts of operations, but believed the sounds should not penetrate into the operating room to confuse the staff. He also employed a radio-phonograph combination, equipped with earphones, and gave the patient any kind of program he wanted—classical or dance music, dramatics, discussions, or humorous records. However, when an abdominal operation was performed, only a very subdued type of music was used.

He states that a few patients did not want to listen to the phonograph. Most of them, however, enjoyed the procedure; some, in fact, asked for the music when they had to undergo a second operation.

It was also reported in the New York Times of June 2, 1941, that as an experiment, Edward L. Cornell had per-
mitted one patient to listen to music while he made a caesarian delivery. With the exception of Tschaikovsky’s “Concerto” in B flat minor, selected by the patient, the music was chosen by a psychologist and piped in over a frequency-modulated radio. One disadvantage of this arrangement was that the earphones had to be removed every time the doctor wanted to speak to the patient.

The idea of an adjuvant that would lessen the amount of anesthetic required and at the same time eliminate the use of drugs for premedication was of particular value in dentistry, where as a rule the patients are not hospitalized. When it is necessary to produce a state of unconsciousness, the choice is an anesthetic that will take effect quickly and wear off quickly. Nitrous oxide has been considered most suitable for this purpose and has become increasingly popular.

However, Guedel (1938) has shown that the action of the anesthetic agent is dependent on the condition of the patient. Difference in resistance to anesthesia is largely a difference in the metabolic state of the patient. The starting point of anesthesia induction varies with the metabolic rate, and the metabolic rate varies with many conditions at the time of the operation [among them being] endocrine imbalance, fever, pain, emotional excitement. . . . The metabolic rate is of importance in anesthesia because it represents the degree of reflex irritability and oxygen demand (p. 61).

Whitacre and Potter (1945), in their paper on general anesthesia in dentistry, write:
Nitrous oxide is the least toxic of the inhalation agents, but unfortunately, it is also the least potent. Since nitrous oxide is such a weak anesthetic agent its use with air was often unsatisfactory, particularly for robust individuals. The only way such patients could be anesthetized was to cause a dangerous degree of hypoxia. Although most people will tolerate a brief period of hypoxia, the practice of deliberately depriving patients of an adequate amount of oxygen in order to produce unconsciousness or insensitivity to pain, is a pernicious and dangerous practice.

Barach and Rovenstine (1945) also warned against the hazards of introducing too little oxygen with this gas, and proposed that nitrous oxide should be given only when mixed with at least 20 percent oxygen and that it be marketed in cylinders containing such a mixture.

It was the need for a method which would permit a lower nitrous oxide concentration that led Cherry and Pallin (1947) to investigate the effectiveness of music during oral surgery.

The tension, anxiety, and fear of the dental patient enhances reflex irritability and raises his oxygen requirement. At the same time the concentration of nitrous oxide necessary to anesthetize the emotional patient may exceed the limit considered safe for that gas.

Attempts by Cherry and Pallin to obtain from the manufacturers the nitrous oxide-oxygen cylinders containing a mixture under proper pressure to deliver no less than 20 percent oxygen, as recommended by Barach and
Rovenstine, were unsuccessful, the change-over being considered impracticable at present.

Premedication with depressive or hypnotic drugs that reduce the reflex irritability had been resorted to, but this practice has the disadvantage of prolonging the office visits to allow sufficient time for the drugs to act and for the after-effects to wear off. There is an added danger in the use of habit-forming drugs when repeated visits to the dentist are necessary. The idea of hypnosis also had to be discarded, for this procedure not only prolonged the office visits, but also produced obvious legal difficulties.

To overcome some of these disadvantages, the investigators decided to try a method that combined "psychological assurance, simple abstraction, and music."

For this purpose they employed an anesthetic machine of the type usually found in dental offices, equipped with nitrous oxide and oxygen yokes, without carbon dioxide absorption. The gases are led by means of rubber tubing to a nose mask with an expiratory valve controlled by a light spring.

The music is furnished by means of an ordinary electric record player with earphone transmission, made with large rubber cups to exclude unwanted sounds. A microphone attachment permits the operator to talk to the patient during the procedure.

From the time the patient enters the waiting room everything is done to minimize his apprehension by cas-
ual reference to the dental pathology and the positive, re-assuring attitude of the staff, enhanced by the use of appropriate vocabulary. All apparatus is kept out of sight or covered.

When the patient is in the dental chair, the conversation is directed to the music, and he is instructed in the method of manipulating the volume control. The following selections were found to be most effective, by the trial and error method: “Clair de Lune” (Debussy), “Moonlight Sonata” (Beethoven), “Dream Pantomime” (Humperdinck), “Evening Star” (Wagner), “Forest Murmurs” (Wagner), “Poeme” (Fibich). But although these records were more frequently chosen and induced the most profound unconsciousness, any music that had a smooth, even tone, without harsh or startling instrumentation, and which was pleasing to the patient, could be used.

After the music is started, the nasal inhaler mask . . . is carefully and lightly placed on the nose, and the head strap is made as loose as just consistent with maintenance of the mask in position. At first the expiratory valve was permitted to open only with expiration, but it was soon discovered that the insertion of a cotton wad which kept it open with inspiration as well did not dilute the inhaled mixtures enough to interfere with the depth of anesthesia. The anesthesia ma-

1 When this method was recently demonstrated before a group of anesthetists, at which time Dr. Cherry did several extractions, he said that patients usually turned the volume up too high, and the music awakened them. A secondary interphone has been inserted which permits the operator to control the volume.
chine was set to deliver 75 per cent nitrous oxide and 25 per cent oxygen, but this mixture was further diluted at the open expiratory valve by an estimated 20 per cent. Once the patient is asleep, the mixture may be further enriched with oxygen to as much as 35 per cent, and even up to 50 per cent.

More than one thousand patients have been treated in this manner, and Cherry and Pallin report that although no respiratory or alveolar air or oxygen blood studies were performed, clinically no hypoxia could be discovered. The mucous membranes, the conjunctivae, the nailbeds were all closely watched for cyanosis and none found. The blood pressure and pulse were frequently checked and little variation found. Although it was often found that the respiratory rhythm paralleled that of the music, the pulse was unaffected except as expected with the reduction of the reflex irritability.

[Side effects] have been notably absent. There is no immediate or delayed induction or emergent delirium. Most of the patients claim that their dreams occupied their period of narcosis, and these dreams were always pleasant. Even children were attracted by the music and submitted docilely to the application of the nasal mask. Only one child of a large series refused to submit to the anesthesia. Only two adults reported slight perception of pain.

The early hesitancy of applying this technique in the poorer risk patients was soon abandoned except in those cases requiring extensive mouth surgery. However, it was found that such surgery could be performed in multistage operations. The increased surgical latitude that this technique provides in the poorer risk patient compensates considerably in permitting extension of the operating time from a minute or
two to ten to fifteen minutes. The longest recorded administration in this series was twenty-three minutes.

They conclude that

music with nitrous oxide-oxygen anesthesia devoid of oxygen deprivation is . . . found to render anesthesia adequate for all types of dental office procedure. Further advantages of this technique may be summarized as (1) a smooth induction as exemplified by the complete absence of excitement, struggling, or delirium; (2) absence of retching or vomiting even after a recent meal; (3) rapid and complete emergence from the anesthetic state so that the patient requires no assistance or support when leaving the dental chair; (4) minimum chair occupation time; and (5) no undesirable effects in the poor risk patient. The occasional patient in whom this regimen is not adequate is so rare as to preclude any discussion.
CHAPTER IX

MUSIC IN INDUSTRY

The laboratory work on therapeutic music has been scanty, but within the last few years experiments have been developed in a different field, namely, the use of music in industry. While these experiments are aimed at bringing out certain results desirable from the industrial point of view and deal also with sound engineering, some of the observations are summarized here because they provide additional data for the study of the therapeutic possibilities of music.

Diserens (1926) devotes an entire chapter to the influence of music on work, giving an historical overview of its use from primitive times to modern society.1 He cites, among others, the classic work by Bücher (Arbeit und Rhythmus, 1919), in which the work song has been traced back to primitive customs. That type of song partook of the nature of ritual and also provided a means for communicating the worker’s attitude toward his job and his employer. The work song chanted by the laborer gave way gradually in more mechanized areas to the songs and instruments of “professionals.”

1 For a résumé of the experimental work reported by Diserens, see pp. 24 ff.
In recent times the use of music in industry, as in therapy, has also gone through a stage of enthusiastic acceptance and high expectations. Like all new remedies, it was at first thought to be a cure-all. It was supposed not only to accelerate production but also to act as a substitute for better working conditions and to intercede for more harmonious relations. On this basis glee clubs and orchestras and group singing were inaugurated in every industrial section of the country.

A survey of this period was made by Clark in 1929. After quoting the opinions of employers, labor union leaders, and employee groups, he concludes, "Music in industry is no longer an experiment. Its efficacy has been practically demonstrated under varying conditions and in nearly every field of industrial activity."

In his summary of the findings he gives the number of firms and their location, the type of industry, the number of bands (267), orchestras (182), ukulele clubs (15), harmonica bands (10), drum corps (6), mandolin clubs (4), saxophone quartets (2), banjo club (1), banjo and mandolin (1), and violin choir (1) among 14,650 workers. With these summaries are reports from the executives or heads of departments describing the extent of activity of the musical groups, which vary considerably, from frequent employee participation and service, to the statement, "Use a phonograph in the salesroom with good results."

Diserens and Fine (1939, p. 216) state that at least four
theories have been proposed to explain the influence of music on work:

(1) The theory of Bücher, Wallaschek and Billroth. They claim the increase of productivity is due to the regulation of the movements involved in work, by the rhythm of the music employed. . . .

(2) The theory of forced attention to work in response to distraction. . . .

(3) The theory of more rapid physiological repair under musical stimuli. . . .

(4) The theory of the direct stimulating value of music.

Their own belief is that rhythm, by relieving the strain of voluntary attention, reduces fatigue and acts as a conservation factor, but that tone is important because it lends force to muscular movements. Mere rhythm would only insure regularity of movement, while tonal stimulus is required to produce a maximum expenditure of energy.

A controlled experiment by Wyatt and Langdon (1937) on fatigue and boredom in repetitive work, published by the Medical Research Council of Great Britain, proved to be a very important step in the objective approach to the problem of music in industry. It was known that boredom was most intense around the middle of the working period and was associated with restless behavior, a lower and more variable rate of work, and an apparent increase in the length of time devoted to a particular job. These symptoms tended to decrease and disappear as closing time drew near.

The operators tried to counteract boredom by talking,
singing, varying the form of activity, and in extreme cases they sought a change of occupation. These diversions are limited in effect, since talking often takes the eyes off the job, and singing at work is usually forbidden.

When phonograph music was introduced it was found to act as an antidote to boredom, and during the time when music was played the increase in output varied from 6.2 percent to 11.3 percent, while the total daily output showed an increase of 2.6 percent to 6 percent. There were, however, isolated instances in which the music seemed to have little or no effect on individual production.

The conclusions arrived at were used by the British Broadcasting Corporation as the starting point for an experimental application of music in factories. The results were summarized by Reynolds (1942) and in a report issued by the British Information Services. More than 8,000,000 war workers in Britain daily heard the BBC’s “Music While You Work” program, and millions worked to the tune of phonograph records, while traveling bands and orchestras gave weekly concerts to as many as 5,000 or 6,000 workers in 1,000 factories. Opinions among employers differed on questions of rhythm, enjoyment, and output.

Among the factors emphasized by this study were the facts that rhythm or tempo should not be thought of in terms of working speeds, but rather as a means of creating a spirit of cheerfulness and gaiety, that the effects of a
musical tonic diminish if it is applied in overdoses, and that the workers who benefit most are those who work at monotonous tasks. It has been confirmed by others that this is especially true for women.

Another survey (Ramsay), intended to determine the prevalence of official rest pauses in British factories, was published in 1939 by the National Institute of Industrial Psychology, which has been interested in fatigue studies. Some 1,050 factories were selected at random in seven industrial areas. The primary objectives in allowing rest pauses were “to reduce the immediate fatigue and nervous strain of the employee, and to increase productive efficiency.” In 41.6 percent the effects on efficiency were good; 13.3 percent showed improvement in morale, better atmosphere, etc. Advantages in specific cases accounted for 11.6 percent, and miscellaneous generally favorable comments were expressed by 33.5 percent. Rest pauses were most often taken for the purpose of obtaining refreshments. The authors conclude that “the effects vary, on the whole, with the degree of organization of the rest-pause system.”

While conducting this inquiry the investigators took occasion to learn whether the factories made any use of music and what its effects were. Of the 970 factories which replied, 89.3 percent had no music, 10.7 percent used music, 4.8 percent provided music only during working hours, and 6.9 percent used it also at other times. They state:
The relationship of official rest pauses and music in the same factory is of considerable interest, but this inquiry has indicated such varied arrangements of rest pauses and music that no general practice can be indicated. Although music may be theoretically regarded in some cases as a substitute for rest pauses, the need for refreshments may modify the situation in practice. It would appear that music should rather supplement than supplant rest pauses with refreshments. There was little unanimity regarding the duration of music at any time.

Of the 47 respondents in whose factories music was provided at work, 35 (74.5 percent) stated that it had beneficial effects on efficiency, while 12 (25.5 percent) stated that it had no effects or that they were unable to observe any effects. None found that music had bad effects. Unfortunately, few respondents were able to produce evidence of the effects of music.

Ramsay and his associates add:

It has been emphasized in this Report that rest pauses must be regarded not in isolation but as a part of general policy. They are, indeed, only one method of combating fatigue and boredom. In some cases, instead of a complete cessation of work, a slowing down of activity, a change of work, the provision of smaller or larger units of work, or the use of music may have equally beneficial results. Before specific methods are introduced, every effort must be made to deal with the factors which induce fatigue.

Broome (1942, 1944) expressed the opinion that expectation helped to create a favorable frame of mind. The thoughts of the workers, instead of being directed to
long monotonous periods of drudgery, were diverted by anticipating the music.

A survey in 1943 of Canadian experience ("Music as a Factor in Production") brought out the fact that there was an increase of 14 percent in production when music was played, with an additional 8 percent production boost if planned programs were used. These programs were found to give speed and contentment in diverse establishments, such as an airplane factory, a bank, and a publishing company.


Music in industry has been successfully introduced in Australian factories, and is favoured by government authorities. . . . As a result of inquiries made by the Industrial Welfare Division, it is revealed that while much information at present available on this subject is indefinite, the following conclusions are well-established: (a) A great majority of employees are in favour of music. (b) Most employers are favourable either on specific or general grounds. (c) Music has some value in the alleviation of monotony and fatigue. (d) Both employees and employers claim that its use results in a general improvement of morale. . . . This Division has in consequence declared itself in favour of the principle of music in industry, but proposes individual investigation into type of work, work conditions, sex and age groupings, and so on.

A report made by welfare officers recommending the introduction of music at an Australian explosive factory [stated that] music aids production in the following ways:
I. It relieves monotony which causes fatigue. II. It provides a type of psychological satisfaction that replaces to a large extent such other human outlets as conversation. III. It is a good-will builder. IV. It supplies rhythm which helps the worker in the execution of monotonous work.

In this country, important experiments on the industrial aspect of the use of music were carried on by Burris-Meyer (1943) and Cardinell (1943) at Stevens Institute of Technology and later taken over by the War Production Board. A symposium on music in industry published by the Acoustical Society of America (1943) discusses several phases of this work. Hough, a contributor to this symposium, observed that after a period of three months, during which music was utilized in certain factories where accident proneness had been evident, there was a noticeable decrease in the number of industrial accidents.

In addition to the many articles that have appeared in popular and technical journals [Jensen (1931), Katin (1935), Humes (1941), Antrim (1943), Halpin (1943), Selvin (1943), Hunter Hughes (1946)], there were published during the war two pamphlets that contain a résumé of the available material. One is by the Industrial Recreation Association (1944), entitled *Music in Industry, a Manual on Music for Work and for Recreation in Business and Industry*. This manual contains a section on the organization of musical activities, the type of instruments to use, and the location of available information of various sorts, as well as a bibliography.
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The other pamphlet—*Music in War Plants*, by Beckett (1943)—was published by the War Production Board after a survey of some 76 war plants which employed a total of 577,000 workers (25 percent women). This publication contains an analysis of the data obtained in the field by use of a report sheet containing fifty questions. The report sheet and charts and tables are embodied in the pamphlet. It discusses the manner in which music is used in different industries, the relation of music to morale and to production, the workers' attitudes, types of music and timing best suited for different shifts, as well as the cost and mechanics of equipment.

The statements in recent publications are in contrast to the early enthusiasm. Tindall (1937), who has organized some 500 music groups, says little is really known of the benefits to be derived from recreation through music; he believes that workers, not management, should do the organizing. Kirkpatrick (1943) holds that "no highly significant or conclusive research has been published concerning the effect of music on output or health of workers in industry."

A bibliography of 95 titles, "Music in Industry" (by Beckett and Fairley), appeared in 1944. The authors note that 73 of the items were published since 1940 and that "basically the function of music in industry is recreational."

The National Music Council also conducted a survey in 1943 on the use of music in shipyards building vessels for the U.S. Maritime Commission.
The investigations begun by Burris-Meyer (1943), referred to above, initiated the current experimental work on the influence of music in industry. While engaged in research on the control of sound for theatrical purposes, it had become apparent to him "that the auditory stimulus is more powerful than any of the conventional means by which the showman can exercise emotional control over his audience." However, no standard existed for applying this tool in specific conditions, for the required data were lacking. In discussing the origin of these studies, Burris-Meyer stated:

The ends to be achieved by emotional control are in industry obviously to suit the man to his task, to give the work the status of a métier, to make it for the man, not what he lives by, not that which produces the pay envelope, but a major element in living. . . . If you have control of the stimulus, if you can define it in terms of intensity, spectrum, and cyclic quality, and then measure the rate and quality of production, lateness, early departure, absences, accidents, and any discoverable indexes of employee morale, without the worker's knowledge that he is a subject, you have a valuable technique for the study of emotional control and can, incidentally, find out what music is good for, and how good it is.

In this first study, made under controlled conditions with the employees on a piecework basis, the results observed were, in general, similar to the representative figures given below. For a group of sixteen experienced workers the average output per employee (measured in quarter hours) increased 6.7 percent on the day when mu-
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sic was played as against the day when there was no music. In a group of 100 workers of mixed experience the total output per 100 man-hours increased 11.4 percent during the week with music, as against one week without music. Another test with highly skilled workers in which music was played for three weeks showed an increase of 4.1 percent over the three-week period when no music was available. The average weekly production was also increased during all but one of eight weeks when music was played, as against the first week with no music. However, these improvements have been considered secondary to the relief of boredom rather than the result of increased speed in time to the music.

Cardinell (1943A, 1944) finds that among the questions still to be answered, even for music in industry, are: What it does; What it can do; and Why. It has been definitely proven that the primary effect of music in industry is to relieve fatigue and boredom. Variation in output, absence rates, tardiness, rejected products, accident rate, and fake illnesses were secondarily affected. The results cannot be attributed entirely to music. "The question of music's ability to reduce fatigue is somewhat shrouded in mystery as science does not yet know completely what fatigue is. . . . An individual's attitude to the fatigue-inducing stress is all-important."

Cardinell and Henry's "Guide to Industrial Sound" (1944) discusses the technical side of the sound system over which music is to be furnished during working
hours, giving the practical rather than the theoretical aspects of the subject.

Pepinsky (1944) studied the affective values of pitch, rhythm, tempo, dynamics, and the effects of the major and minor modes, of tone quality, and of the harmonic and melodic values of music in an attempt to determine the influence of these elements on the choice of music in industry. His subjects, a group of graduate students, fell into four categories: (1) those who liked music, but admitted that they knew nothing about it; (2) those who professed an absolute dislike for it and would ordinarily avoid it; (3) those who liked the latest songs and dance bands; (4) those who seemed to be intimately acquainted with the literature of the classical and modern composers, but had had no formal musical training. No one of these students was interested in music as a profession.

All submitted to being studied with regard to the psychogalvanic reflex, electrocardiogram, blood pressure, pulse, and breathing rate while listening to good phonographic reproductions that were unfamiliar to the subjects. Subjective responses were extremely vague. As measured by the instruments, the findings indicated that it seemed to be a matter of degree rather than of type of response to the musical stimulus.

He concludes that "obviously one must be reconciled to the fact that the net results of such attempted application can be no more valid than the assumptions made to aid in the desired solution."
Starting with the premise, as noted by Kerr (1942), that most people believe that music has certain beneficial effects, Middleton and his associates (1944) undertook an experiment to determine whether these effects exist.

Specifically, the problem may be narrowed down to these questions: (a) What effect does music have on an individual's subjective feeling of tiredness? (b) What effect does music have on an individual's subjective feeling of unpleasantness? (c) Does one type of music produce a more marked effect than another on feelings of tiredness or unpleasantness?

No attempt will be made to discuss the various theories of why music has these effects or what these psychological or physiological states are.

The subjects tested were 160 psychology students between the ages of 17 and 23 (84 men and 76 women). The socio-economic and cultural status of the group was considerably above the average, and the students also ranked high in their knowledge of music.

Recordings of waltz and popular music were played over a two-minute period at uniform volume. At the end of the two-minute period the subjects rated themselves on their feeling of fatigue or unpleasantness at that instant. Two rating scales were divided into five segments, to be marked by an appropriate phrase denoting the degree of feeling. The subjects were not told the purpose of the experiment.

Each group met three days a week for about fourteen months, therefore rating themselves 23 times on both
fatigue and unpleasantness, and giving a total of 3,000 ratings on each feeling continuum (examination days excepted). One experimental session each week was used as a control, when no music was played; thus the 23 weeks were divided into 8 without music and 15 with music (7 in which waltz-instrumental selections were used, 8 with popular-vocal music). On days when no music was played, all subjects rated themselves simultaneously as soon as the scales had been distributed.

A reliability rating was also obtained, and this proved to have a high coefficient, but the authors point out that it is possible that memory may vary on this point and that adequate technique for measuring the reliability of anything as transient as feelings of fatigue and unpleasantness is difficult.

A statistical analysis was made of all the data. On a nine-point rating scale it was found that all the means were somewhat less than 5 (the indifference point on the scales), and that the men tended to rate themselves as slightly less tired than the women. The average of all the fatigue ratings was 4.14 for men and 4.20 for women. The men rated themselves as feeling somewhat more unpleasant than the women: 4.04, as against 3.79.

The authors list the following conclusions:

(1) There is a coefficient of correlation of .51 between the ratings of tiredness and unpleasantness made under the three experimental conditions of this study. This indicates that, although the two rating scales are not measuring precisely the
same thing, a definite relationship exists between these two feelings. (2) Both men and women rate themselves as feeling less tired (more rested) and less unpleasant (more pleasant) when they are listening to music than they do when they rate themselves while no music is heard. (3) Popular-vocal music seems to have a somewhat more favorable effect in lessening feelings of tiredness than does waltz-instrumental music. This is somewhat more true in the case of the men than of the women. (4) Popular-vocal music seems to have a slightly more favorable effect in lessening feelings of unpleasantness than does waltz-instrumental music.

After surveying the results of these and other studies, Kerr (1945) conducted a series of experiments designed "to test more rigorously than ever before the claims advanced in favor of the effects of music on quantity and quality of production." The object was to learn the effects of music (usually provided by the plant broadcasting studio located in another building) on average worker efficiency in certain types of factory operations, and the tests were therefore carried out among factory workers and under workroom conditions.

In a monograph published in 1945 he has presented the data on four experiments. The first three attempted to evaluate the effects of music, less music, no music, and specific types of music on production; in the fourth, a comparison was made between the effect of standard phonograph records and Orthacoustic records on quantity and quality of output.

Experiment 1: naval capacitor manufacture, involved
64 subjects having a median age of 30. This test was brief, but suggests, "nevertheless, a very slightly greater net good yield with music than without music."

Experiment 2: the quartz crystal experiment, employed 53 subjects, having a median age of 22. This was a carefully controlled test, and "in six out of six comparisons with quantity, scrappage, and net-good-yield data, the differences are in favor of industrial music as opposed to no music."

Experiment 3: the radio tubes experiment, used 520 subjects, having a median age of 21. The short period of the test make the results inconclusive, and the investigator states that "greatest emphasis should be placed on these two results: in two out of two manufacturing sections employing together 520 tube-assembly workers, greater average output was obtained on more-music than on less-music days; in three out of three manufacturing sections, higher average quality was obtained on less-music than on more-music days."

Experiment 4: the Victor-Orthacoustic experiment, involved the same 53 subjects as in Experiment 2. Comparing only the one variable of "30 music days with 30 no-music days, four of the six averages obtained are in favor of the music days."

In interpreting the results, Kerr writes: "Despite the absence of 'statistically significant' critical ratios for individual experiments, the pattern of results in the various investigations is consistent in indicating that music does
affect production in the type of repetitive manual operations studied." He has evaluated the data on his own as well as other experiments referred to in his monograph, on the following basis:

1. *Effect of Industrial Music on Quantity of Output.* In these five experiments involving 12 comparisons between average output on music days and average output on no-music days, the experimental results favor the music days.

2. *Effect on Quality of Output.* In these five experiments involving ten major comparisons between average quality of output with and without music, seven of the ten experimental results indicate higher quality without music or with less music. All three of the results favorable to music were obtained in hourly-rate-pay departments.

3. *Effect on Net Good Yield.* In these three experiments involving five comparisons between average net good yield on music days and no-music days, all five of the differences are in favor of music. The smallest difference was obtained in an incentive-pay situation.

4. *Effects of General Types of Music on Production.* Four experiments which evaluated the effects of certain general types of music on production fail to point toward any great superiority of any one music-type, except that music of moderate or fast psychological tempo seems to be more beneficial to production than music of slower subjective tempo.

Kerr's final conclusions follow.

In 12 out of 12 comparisons, average output was greater on music than on no-music or less-music days. In 7 out of 10 comparisons, average quality was higher on no-music or less-
music days than on music days, while in the other three comparisons the opposite was true. In 5 out of 5 comparisons, average net good yield was higher with music than without music. Present evidence indicates that best production is achieved with music that is subjectively of moderate or peppy tempo. Music in these experiments was associated with greater percentage of production increases in those departments not having incentive-wage systems. Additional research is needed on the effects of specific musical factors on efficiency.

In another article (1944) Kerr has also reported certain psychological findings connected with these experiments, regarding

(a) work preference of job applicants and factory workers with reference to music; (b) music type attitudes of industrial workers; (c) voice type attitudes of industrial workers; (d) believed effects of music; (e) actual effects of different types of music on euphoria, morale, and specific subjective feelings; (f) effects of different types of music on the productive efficiency of workers doing various kinds of jobs.

The psychological tests also convinced Kerr that there is factual justification for supplying music to workers engaged in repetitive manual tasks if a majority of the employees want music and provided the programs are scientifically organized. The workers' preferences should be measured rather than guessed at. He also suggests that special attention should be given to night-shift workers.

Observations in special work areas have shown that persons working in noisy factories may also enjoy a mu-
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sical program if the proper material is chosen. Hunter Hughes (1946) noted that few production workers use hearing as a part of their jobs and for that reason music is not a distracting influence. However, the incessant din of machinery, without music, means that the tone is never changed and results in the fatigue of monotony. McPeak (1946) observed that “the racket in a canning factory is such that workers cannot talk with each other and so are isolated, but music seems to help them feel not so much alone.”

The benefits of music are not confined to factories. Several of the plants with large offices, and firms that employ office help primarily, namely, banks and insurance companies, found that music was favorably received by the workers and often resulted in greater efficiency. However, for those doing mental work it is important that the volume be kept low and that the selections include only unobtrusive numbers (Cardinell, 1943; see also McDaniel, 1945; Leach, 1946, 1947).

A review of some of the research done on music in industry from the point of view of the program director led Benson (1945) to conclude that “too much importance has been attached to the scientific reports as they exist today. Just what the correct method is for scientifically testing the value of industrial music cannot be answered by any one person.”

She lists ten questions still to be answered, among which are the following:
Do request slips [for specific music] represent all the workers? If so, how much importance should be attached to them? Can a more accurate survey be made of the workers' music preference? Do employees understand the classifications used in present surveys? Can a survey be based on the auditory preference of the workers . . . on the basis of the music itself rather than the titles? . . . Is there a difference in production and morale between specially prepared programs and radio broadcasts, or wired music? . . . What is the actual value of music to morale in terms of absenteeism and accident rates?

From her own experience the author discusses in detail sample programs for work and lunch music and reasons for choosing certain records and their position on the program. She also includes a representative time schedule for eight-hour and ten-hour shifts. She makes the point that programs should be arranged according to conditions, workers, and type of work in each plant.

Benson’s book contains a “discography” of approximately forty pages, commercial records classified as to their uses in industry.

The Music Educators National Conference (1946) has published a résumé covering the history and present practices in the use of music in industry and discussing equipment, timing, music libraries, available research and institutes, and similar topics.

Spears (1947) investigated the subject for the National Industrial Conference Board for the purpose of obtain-
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...ing answers to the following questions raised by management: "Which types of music are best suited for industrial use? Does music appreciably affect the attitudes of workers? and Can music be used satisfactorily in offices?"

She found that there was little statistical material available, and that the extent to which industrial music is used is not known with any exactness. "Of the 262 plants and offices surveyed by the Conference Board, 42.4%, or 111, are using some type of music for employee work or recreation. Among the remaining 151 organizations, 1.9% are considering trial installations, while 2.7% are studying the various sources of music which are available to industry."

The programs were distributed approximately as follows: work periods, 83; recreation, 34; lunch, 48; other, 23; not available, 4. The following sources were used: radio programs, 38; phonograph records, 71; wired music, 39; transcriptions, 24; live music, 8; other types, 3.

Supervision of the industrial program, as in hospital music, was generally left to the part-time services of miscellaneous personnel, only 9.9 percent of the plants employing full-time specialized personnel for this purpose. Spears has compiled a list of qualifications considered desirable for a director of work music and for a leader of employee-participation programs. She has also added several tables and charts showing employee preference in 13 plants and in 15 offices for various types of music.
Concerning management's attitude toward the effects of music, the report quotes the following statements (p. 16) with regard to specific objectives:

**Absenteeism**—9 out of the 111 . . . using music have reason to believe that the service has contributed to lowered absentee rates, while 20 plants report no changes. 3 are doubtful of its value. The remainder are unprepared to state an opinion. . . .

**Turnover**—15 plants recorded reductions. . . . In several cases greatest changes occurred in lower-level jobs. 14 plants noticed no differences, 2 are doubtful, 75 have made no effort to determine this. . . .

**Safety**—Reduced fatigue and lessened tension resulting from the use of music have decreased accident rates in 8 plants. The remainder did not notice any difference in rates.

**Individual production**—While it is difficult to attribute an increase in efficiency to any one factor, 29 of the 111 plants concluded that music improved production rates in varying degrees from "a slight increase" to 30%. A few showed decrease because of distraction. In one case workers complained that music interfered with concentration.

**Quality of Work**—General quality improved in 15 plants. In several cases greater concentration reduced spoilage and rejects. A few slight but consistent adverse effects [resulted], but the majority do not feel qualified to express opinion. . . .

**Health**—While a large number of plants have no way of measuring [this], some of the plants believe reduced tension resulted in fewer complaints of "nervousness." . . . A few employees believe that music makes them nervous and restless.

**Punctuality**—Seven plants reported improvement. . . . Most reached no conclusion.
Individual Attitudes—. . . Approximately 54.1% are of the opinion that music promotes greater harmony and good will among workers. . . . A few adverse criticisms primarily relate to programming and reception. . . .

Costs and other factors related to programming are also discussed in this report, which also includes an employee music questionnaire and a form for survey on attitudes toward music, with 52 selections listed, marked "Like it; indifferent; dislike it."

At a meeting of the Acoustical Society of America in 1947 Cardinell and Burris-Meyer stated that, whereas the number of persons who listened to music at work prior to the war probably did not exceed 500, today the estimate is close to 5,000,000. However, if music is to have the desired effect, the program must be based on sound principles that have been scientifically tested, and should be under the direction of persons especially trained in the combined techniques required for the particular task. Music can do a good job in industry if certain prevailing misconceptions are discarded. To accomplish the desired aims the persons responsible should understand that

Music in industry can only operate through the psychophysical responses of the person who hears it. Its primary objective must be limited, therefore, to what is possible in that field, i.e., the establishment and maintenance of a desired emotional relationship between the man, his work, and his environment. With respect to this objective, two requirements must be met: (1) The music must be functionally effective, i.e., it must turn the employee out at the end of
the day in a more desired psychological and physiological condition than he would have enjoyed had no music been employed. (2) The music must have a high acceptance factor, [and acceptance] is not susceptible of the same type of measurement as is function.

To be functionally effective the music must be used to counteract the natural degeneration and reinforce desirable changes which take place in the individual during his normal working day. . . . It must not seize and hold conscious attention of the listener, to the detriment of his activity. . . . A high acceptance factor . . . must be assured by means other than guess or simple popularity poll. . . . Programs for functional purposes must be arranged on a basis of proportional representation of musical tastes, [which] requires a truly scientific job of music preference analysis.

A recent monograph prepared for the American Psychological Association by Henry Clay Smith (1947) has carried the study of music in industry further along than had been possible in some previous experiments. This experiment was conducted during a twelve-week period in a single large building of a radio assembly firm employing approximately 1,000 persons, in three eight-hour shifts. Over 75 percent were women. The purpose of the study was to determine employee attitude toward music, the best method of programing, and the influence of music on piecework production and industrial accidents.

The author describes three general methods of study to test certain hypotheses that had been formulated on the basis of previously reported investigations.
Employee attitudes were determined by the use of questions submitted before the experiment was begun, reading "If music were played while I worked I would find it: unpleasant, neither, mildly pleasant, quite pleasant, extremely pleasant," and so on. Over 70 percent of the questionnaires were completed.

During the seventh week of the study the attitudes of 36 operators engaged in a highly repetitive task were checked by brief personal interviews. The workers were not told that a production study had been going on during the period of the music experiment.

The influence of music on production was measured during two shifts on a competitive assembly line, each shift averaging 21 employees. An incentive pay system had been introduced two weeks before the music study began.

Accident and sickness records kept routinely by the company were analyzed for all the employees during the period of this study, and correlated with the various factors operating during the music program.

The amount of music during the first eight weeks varied from 0 to 62.5 percent of the working time—0, 1, 2, 3, 4, or 5 hours per shift, rotated during the weeks for even distribution. The records were chosen from a large collection ranging from current popular to classical music.

The author has included in his report several graphs and tables giving the results observed on the factors measured, for the group as a whole and for the different com-
ponents of the group, according to age, sex, type of operation, and hours of work, as well as the type of music, time and duration of the program. While the results are not equally conclusive for all the objectives listed, each hypothesis was considered in relation to the observed data because such analysis might lead to a fuller understanding of the "basic causes" for the existing relationships. He states that "When the original unadjusted production figures were used, the percent improvement with music was 5.9 for the day shift, 12.4 for the night shift; when the adjusted figures were employed, these percents increased on the day shift to 7.2 and on the night shift to 17.3" (p. 53).

Smith has summarized the results as follows (p. 57):

Employee Attitudes — 1. Almost all of the employees (98 percent) thought that music during working hours would be at least "mildly pleasant," and 74 percent thought that it would be "extremely pleasant." 2. The intensity of interest in music while working decreased somewhat with age. . . . 3. No sex differences in the intensity or type of musical interest were found. 4. Personal interviews with a sample at the end of twelve weeks showed no decrease in the desire for music while working.

Piecework Production — 1. Production under varying conditions of music increased 4 to 25 percent. . . . 2. Maximum production increases were found when music was played 12 percent of the time on the day shift, 50 percent of the time on the night shift. 3. Production tended to decrease with a large increase in the number of semiclassical selections. . . . 4. Production increases varied with the hour at which
music was played and were greatest during the hours of low production. 5. The more an employee wanted music, the more music tended to increase her production; the lower the employee's production, [and] the more the employee's job permitted conversations while working, the more music tended to increase her production. 6. The greater effectiveness of large amounts of music on the night shift . . . of varied music . . . and of certain distributions of music corresponded with expressed preferences for [these factors].

Industrial Accidents — 1. No difference was found between the number of accidents on music days and on no-music days when the three shifts were combined. 2. The day shift had a relatively large increase in the number of accidents with music, the other two shifts, slight decreases. 3. Accidents tended to increase on the day shift with increases in the amount of music, but not on the other two shifts. 4. Accidents tended to increase with a large increase in the number of semiclassical selections played, but not with a large increase in the number of vocal selections played. 5. Accidents tended to increase more with waltzes in the opening period than with marches. 5. Accidents tended to decrease with music in the earlier part of the shift but to increase with music in the latter part.

The employees in this plant, as in those investigated by Kerr (1945) were already accustomed to having music during work, but had been without it for about six months (when employment with this company began).

An important factor that has been seemingly ignored by the hospital music director, but forced on the program director for music in industry because of the nature of the environment, is noise in relation to music.
Collier (1941), a British physician, in discussing the psychology of hearing as related to the industrial environment, advanced the hypothesis that musical sounds are usually pleasant, and unmusical sounds generally unpleasant, because the process of conditioning has linked loud noises with danger. They therefore tend to stimulate the protective mechanisms and emotions. Musical sounds are usually associated with safety and comradeship and are therefore not linked with the self-protective mechanism.

For countless generations music has been associated with the activities of the group, herd, or family and their instincts and sentiments. Music and its enjoyment are social activities; under its influence primitive peoples can dance to the limit of physical endurance, because certain kinds of rhythmic music enhance muscle tone and release fresh sources of energy for fatigued muscles and nerves. But nonmusical sounds or noises can produce a similar effect. It is known that certain noises, under certain circumstances, increase the output of energy and increase efficiency at least temporarily. Apparently the noises that produce this effect are those that stimulate the self-protective and self-preservative instincts and sentiments. However, the increased efficiency produced by loud sounds rapidly leads to fatigue and a fall in efficiency.

Bartholomew (1942) has stated that the boundary between tone and noise is not fixed, and that one's attitude or mood may determine whether certain sounds are classed
as tones or noises. He also calls attention to the fact that practically every instrument produces some noise at the moment it is played which identifies the instrument for the listener. These noises, if they are not too obvious, even add to the aesthetic value and emotional content of the music. However, "even the finest music may at times be noise to a person" if one accepts the definition that noise is any undesired sound.

The problem of noise and music in relation to physiological and emotional as well as industrial effects has been reviewed by Laird (1930, 1933); Harmon (1933). The industrial implications of the subject, which received much attention in recent government research, have been discussed by Stevens (1946) and many others. Farnsworth (1934), Gardner and Pickford (1944), and Miller (1946) have referred to the aesthetic aspects of the problem and studied the annoyance potential. Any sound that was judged a noise by the listener had an undesirable effect, with the exception that in certain modern music the introduction of dissonance as contrast was not unpleasant. This latter effect, however, was judged by well persons, and it is generally conceded that for hospital programs jazz and similar types of music are to be avoided.

Berrien (1946) published a critical summary of available studies pertaining to the effects of noise on human beings. He mentions several definitions, but his paper is "primarily concerned with noise as unwanted sound . . . degree of annoyance varying from 0 to some maximum
point.” He discusses procedures in measuring noise, effects on production, influence on vital processes, adaptation to noise, factors affecting the annoyance of noise, and stimulation deafness, and states:

Even though no experimental studies have been reported dealing with effect of noise on emotional control or emotional stability, the reports . . . indicate physiological changes of the kind associated with emotional disturbances. Many of the changes noted in response to noise are similar to, if not identical with those produced by stimuli exciting fear, anger, and general emotional tension . . . . The available scientifically controlled studies are not in complete agreement but tend to show ill effects in output, speed of work or vital processes. . . . Marked individual differences in susceptibility to the ill effects of noise have been noted but no reported attempts have been made to correlate these differences with other facets of personality. The factors determining annoyance have not been subjected to thorough analysis.

Students of production methods have given a great deal of attention to the matter of harmonious relations within the plant with respect to output. Whitehead (1938), who has conducted considerable research on the work environment in relation to production, established that certain sociological elements had as great an influence on satisfaction with the job, decreased fatigue, and increased productivity as did economic incentives. Among the former are the physical environment and the more in-
tangible factors of intergroup relationships that make the worker feel that he is a vital part of the group.

Other writers (Redmon, 1946; Miller, 1946) have also noted the importance of social incentives in the industrial environment. Music may prove to be one of the influences in creating employee morale, and if it helps to provide a more favorable social atmosphere in the factory, that in itself may be responsible for increased production. However, the social variables are many, and each exerts its influence on every other factor. The complexities of the subject have been investigated in various ways, from the psychological and economic as well as the social point of view (Barmack, 1937; Roethlisberger and Dickson, 1939; National Research Council, 1941; Fraser, 1947; Rennie, Swackhamer, and Woodward, 1947; Warner and Low, 1947).
CHAPTER X

SUMMARY

The idea of music as therapy is rooted in antiquity, when activities were more often guided by ritual, and because music played so large a part in ritual, it was but a step from music in medicine to music as medicine.

When the benefits, if any, were attributed to music itself, the patient was usually a person who was fond of music. However, each report of a favorable influence, no matter what the reason, served to create a seemingly formidable amount of evidence, in spite of the fact that later writers merely reported the same "cures." These isolated instances were so oft reiterated that they came in time to be accepted as proof that music per se is a therapeutic agent.

In reviewing the literature on music therapy it is not always easy to distinguish the statements based on mere impressions from those that represent objective observations. Much of this difficulty lies in the fact that in many places where musical activities have been introduced it has been left for the most part to a lay person to decide what should be considered a therapeutic basis. Even where there was some medical supervision, it was the musician or the therapist, not the doctor, who "prescribed the medicine."
The use of music is urged most by those who are themselves musical, and attempts have been made to explain the influence of music by a method of reasoning that found in the human organism characteristics which would cause it to respond in a specific manner to the properties inherent in musical stimuli (rhythm, vibration, etc.), such response being noted as a change in mood or an emotion.

It is symptomatic of the paucity of original material on music therapy that, although this form of treatment has been used and recommended for so long, the amount of experimental work is so meager and that controlled experiments concerned primarily with the sick are practically nonexistent. Some so-called experimental results might as logically be classed with empirical findings. Music is said to influence the rate of certain physiological processes, such as blood pressure, respiration, and heartbeat. Those who cite experimental results as favoring the use of music in therapy are prone to refer to any such work reported, even though some experimenters employed obsolete methods or based their observations on only one subject and in a situation that had no bearing on the current problem. Although some observers also noted adverse effects, these observations are often ignored.

It may be said that every use of music is in effect an experiment, since there are as yet no valid established methods that may claim therapeutic certainty. While music may be used in a number of ways, how it acts is a matter still to be learned. With few exceptions the experimental
findings have served rather to pose new questions than to clarify the problems relating to the effects of music.

The objective methods have employed arbitrary tests that measure isolated actions, whereas the results obtained have been used as a gauge of total behavior. The validity of the tests has not always been demonstrated. What has been attempted is, in fact, the measurement of a mood, which is transient and personal, by a unit that is itself evanescent and intangible.

Mood effects are often judged by subjective reports based on predetermined word lists made to conform to the emotions that the music is supposed to evoke. Introspection thus plays a large part in some of the experiments, and while valuable general information may be obtained in this manner, the verbal responses are likely to be colored by association, and the method is statistically unreliable. Moreover, the subjects are not all equally trained to recognize the type of emotion portrayed or to articulate the verbal equivalent of the emotional response. Whereas a distinction is made between responses of those who like music and of subjects who are indifferent to it, tests of musical aptitude have not always been administered to the subjects participating in the experiments.

Both the objective and the subjective methods reveal that the reactions differ in different individuals and may be modified by such factors as the condition of the subject, the state of immediate environment, or the familiarity and repetition of the music, as well as the type of
music. There are indications that for those who are indifferent to music, music acts only as an indifferent stimulus; in some individuals of this type the playing of either stirring or soothing music produced no changes in heartbeat, pulse rate, or blood pressure—processes that might be expected to react even to unmusical sound.

Music may be mere noise for those who are not musical, but little has been said on the subject of noise as a function of music and as a concomitant of the environment by those who advocate music therapy. Experiments specifically designed to learn the efficacy of music on a group composed entirely of "nonmusical" patients might, perhaps, give a new basis of comparison in controlled tests. The problems of fatigue and noise and their modification of the receptivity of auditory stimuli have not been sufficiently considered with respect to the hospital patient, especially where there is no medical direction of the musical program.

Practically all the experiments have been carried out on a small number of healthy subjects of a nearly homogeneous age group. Separate control groups have not always been used, nor have the same experiments been repeated by other investigators under similar conditions.

The factor of conditioning has not been sufficiently guarded against, in the type of music used and in the order of the experiments, nor has the relation between the kinesthetic and the physiological changes observed been given sufficient weight. The music employed for the ex-
periments has almost invariably been recorded, whereas that used in institutions is more varied, and many writers emphasize the value of "live" music and the role of the performer's personality in eliciting the proper attitude on the part of the patient.

It has been stated that music does not always convey to the listener the mood intended by the composer, even when the listener is another musician. There is also the chronological factor to be taken into account: music of an earlier era does not always affect present-day listeners as it affected contemporary listeners, especially if its influence was due to associative as well as melodic elements.

Even experiments that are well conducted insofar as keeping of records is concerned are not always performed by people equipped to interpret the meaning of the physiological changes observed. This does not, of course, apply to all tests. But the scientifically controlled experiments are too few in number to furnish a basis for proof.

Another reason for the lack of factual data appears to be that, although the subject of music therapy is a highly complex one, many studies have been confined to single aspects of the field. Conclusions based on investigations conducted from the point of view of the musicologist, namely, the aesthetic and technical approaches, have sometimes been applied to an interpretation of the psychological and medical problems confronting the therapist.

Music therapy is a part of rehabilitation and occupational therapy, for which casework techniques are essen-
The concept of rehabilitation itself has undergone a change in the last few years, the emphasis shifting from vocational retraining to physical restoration as the initial step, with greater dependence on the medical sciences. Every phase of rehabilitation, including the use of music, needs to be re-examined in the light of these modifications.

Those not of the medical profession have not always kept in mind that they are working with patients who require treatment by medicine or surgery or psychiatric understanding. Although music may be used at any stage of these treatments, it remains a tool of these therapies, and as such it must be subordinate to them. What its exact role is to be is a matter for future research.

More of this research is needed in the milieu where music therapy is to be employed and with the subjects for whom it is intended. Studies need to be carried on by a team composed of the clinician, the psychiatrist, and the musical expert, so that the various factors of their specialized knowledge may be co-ordinated in setting up the "design," in measuring the results, and in interpreting the observations correctly. Although the results of tests relating to problems in musicology or education do not necessarily apply to the interpretation of medical experiments, the vast literature on musicology and data from physics and engineering tests offer a working basis for objective study of the use of music in therapy.

There is evident in recent writings a recognition of the
need for fuller knowledge on the subject and more precise definition of goal. Clarification of terminology is also being sought, with a view to defining the musical stimuli in such a way as to embrace the aesthetic content without being limited to that area. This would make possible better co-operation in research by various groups and would result in the production of music written for the special function it was meant to serve.

One application of music which parallels an experimental set-up because the results lend themselves to more accurate measurement is its use in the operating room. Although the reasons for its action are not known, it has been possible to use a smaller amount of anesthetic when a patient is listening to music that he enjoys than might otherwise be the case. Further study on the nature of the music best suited for this purpose might help to clarify its action in other instances, and might also determine what role the hypnagogic effect of rhythm plays in the process of anesthetization.

As for the use of music in industry, since one is here dealing with healthy persons engaged in other activities, the problems of its effects are quite different. However, it has not been determined how these effects are obtained for industrial music any more than it has for therapeutic music.

Although the early optimistic expectations have not been fully realized, the use of music in factories has provided indirect benefits wherever proper equipment, tim-
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ing, and programing have been employed. It may be a fac-
tor in reducing fatigue of workers employed on repetitive
jobs, and it may aid morale by bringing the group to-
gether in a social experience. Selections must be made,
however, according to the age, sex, and other physical
and sociological characteristics of the working group, and
according to the physical aspects of the plant or the office
—whether the work is monotonous or creative, noisy or
demanding concentration, whether the worker is one of a
large group or a small unit.

In industry, too, further research is needed on these
and other problems. While the mechanics of production
and the engineering of acoustics and design are more ac-
curately known, programing is still in the trial and error
stage. The effect of music on production is a variable that
depends on other components of the factory environ-
ment, and whether the use of music will be considered a
success or failure depends on what it is expected to ac-
complish.

The influence of music, whether in the factory or in
the hospital, cannot be measured in terms of static units.
However, it is easier to study industrial music, because it
is possible to determine the performance index, to note
the changes in production with a change in the amount
and type of music and the time of day at which it is
played. If the “fatigue curve” correlated with lessened
production levels off consistently after the playing of mu-
sic, it may be taken as an indication that the musical pro-
gram has a beneficial effect on the worker. While an increase in production may sometimes result in poorer quality, that factor is also measurable, and the conditions may be modified.

With the data now available it should be possible to chart continuing or follow-up studies of a large group over a sufficiently long period of time, during which other major influences could be observed and canceled out, as for example, incentive pay, change in supervisory personnel, modification of safety provisions, welfare measures, and so forth.

In hospital work no such control has yet been attempted, but the facts learned in industrial experiments may also aid research for therapy by supplying the basic tools and data on acoustics, engineering problems, and the physics of music.

Since so little of definite value is known, is there any justification for the extensive use of music in hospitals or in similar institutions?

As recreation and diversion, of course, music may be enjoyed by the hospital population just as it is by the general population. With the spread of musical education in recent years through the radio and by other means, more people are accustomed to turn to music for relaxation, and this would apply to the patients as well. Even those who have no special yearning for music would be interested in the diversion of a concert or of community singing sometimes; it would add variety to the activities
available for those who must remain in the hospital a long time.

Group activities of this kind create a pleasant atmosphere that raises the morale of patients and of hospital personnel, helps the patients who participate in them voluntarily, and thus may aid in upholding good relations between patients and staff.

They also open the way to resocialization for some patients who have withdrawn so completely from normal contacts that they are inaccessible to words alone. Rapport with these patients can more easily be established by such indirect means because listening to music is the highest level they can participate in, and this may serve as a preliminary to more active social contacts.

Group methods can also be employed with special objectives in mind—for example, in psychodrama for the study of some particular problem that the patient can work out for the psychiatrist.

Music may be a means of temporarily changing the prevalent mood of psychoneurotic and psychotic patients. Its role in this respect, however, is no more predictable than its influence on physiological processes, and opinions vary regarding the type of music to be used in a given instance.

One point to be considered is that a patient who has been long in bed does not need music which arouses a mood of introspection, even though the nature of the associations may be pleasant; in him there should be
stimulated a sense of participation which more often results from conversations, even though they may be only overheard (indirect participation). The radio with its dramatic programs and news coverage, performs this function better than musical programs alone. Indeed, it has been said that a patient's preoccupation with music to the exclusion of other activities may mask an actual maladjustment.

Musical activities may serve to hasten recovery of the patient who is musical or who has an ambition to play some instrument. Other patients may be taught to play a simple instrument as a hobby, provided the objectives are not beyond their capacity. Instruction for such purposes may be made part of an occupational therapy program to vary the activities or an end in itself.

The playing of an instrument may also be employed in physical therapy for the exercise of particular muscle groups, and may be used as an adjunct in the treatment of certain disorders where the rhythmic timing of an act is desired, such as speech defects, and so forth. The simpler instruments have been used to advantage in this respect, and certain modifications have also been made in others so as to enable the patients to use them with greater ease.

Active participation in music programs benefits the patient in general, over and above any specific objective, in that it makes him feel that he is participating in his own
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rehabilitation, and furnishes additional motivation for recovery.

For those who cannot or do not wish to play an instrument, there is the possibility of acquiring a knowledge of music and musicians through "music appreciation." The latter activity has special significance for persons with chronic illnesses, who can carry away from the hospital a new interest that can be a source of pleasure without making too great a demand on their energy.

Whether the term "therapy" should be applied to any of these programs or whether the purpose may be better served by activities other than music is a question to be decided by the medical profession.

The introduction of a music program presents many technical and economic difficulties as well as medical and social problems and emphasizes the importance of the supervisory personnel. The magnitude and resolution of these problems will depend on the individual organization. Some of the general aspects have been covered by a few of the writers mentioned in this survey.

One factor of paramount importance is the supervisory staff. Whatever the purpose of the musical program, the person in charge needs to understand the objectives aimed at and the technical aspects of the subject and at the same time be able to convey to the patient a sense of voluntary participation in the activities prescribed for him.

A beginning has been made by establishing courses and
institutes for the training of personnel. While it may seem like reversing the process to put teaching courses ahead of therapeutic research, it has at least the advantage of acquainting the musical profession with the medical and social problems to be faced in the rehabilitation of the patients that come under their supervision.

Perhaps an entirely new approach to the subject of music therapy may provide the answers to the many questions that have been raised by various investigators. Certainly mere repetition of the expected benefits, based on reports of a one-time cure or unrelated tests performed long ago, cannot satisfy these problems.

Obviously, the more widespread the use of music in hospitals and similar institutions, the greater is the opportunity to study its possibilities as a therapeutic agent. Such an opportunity is now available through the programs provided in civilian and military hospitals and through the facilities of the Veterans Administration.

With improved techniques available from the fields of physics and biology, and the newer methods employed in the study of physiology and psychotherapy, it should be possible to set up a program of co-ordinated research that would define the field of usefulness for music in medicine.

The student of functional music has to consider three phases of the problem. First is the knowledge available on the techniques of music and the elements that make up the total stimulus—tempo, rhythm, melody, pitch, and
so forth—and how they may be manipulated or con-
trolled for a given purpose.

The second is the knowledge available for the under-
standing of the patient as a person. That requires the
study not only of his present condition and attitudes but
also of his background and the goal as envisioned by
clinical treatment. For this purpose it is necessary to go
farther afield than the work with music therapy has pro-
ceeded heretofore. Only a few of the complex factors
that have a bearing on the subject have been mentioned.

The third phase is the knowledge available for com-
bining the principles from these two broad fields into a
program of application for specific ends. The trend now
is in the direction of co-ordinating the work of interested
groups in local communities, as well as on a national
scale, and efforts are being made to organize and extend
the available knowledge.
REFERENCES to the earlier literature (as well as later items) are to be found in the bibliography compiled by Salmons\-sen (1941), and the publications of Diserens (1926), Diserens and Fine (1939), Ingegnieros (1907), Sigerist (1943), and Washco (1933).

Extensive bibliographies covering the more recent literature on the general subject, as well as on the special and related topics referred to in this review, are to be found in the publications of the American Council of Learned Societies (1938), Anschütz (1927-1931, Vol. I), Bartley and Chute (1947), Beckett and Fairley (1944), Benson (1945, a 40-page "discography"), Darrow (1947), Daugherty (1940 and 1943), Dunbar (1946), Hungerland (1945-1947), Meiers (1946), Mursell (1937), Noble (1944), Ortmann (1929 and 1933), Rennie (1947), Ruckmick (1913-1924), Schoen (1940 and 1943), Seashore (1938), Skard (1946), Stevens and Davis (1938), Thomas (1943), Ustvedt (1937), van de Wall (1936, see p. 106n), and Watt (1917).

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