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THE EFFECTS OF DIFFERENT TYPES OF MUSIC ON MOOD, TENSION, AND MENTAL CLARITY

Rollin McCraty, MA, Bob Barrios-Choplin, PhD, Mike Atkinson, and Dana Tomasino, BA

Rollin McCraty is director of research, **Mike Atkinson** is laboratory project manager, and **Dana Tomasino** is a biologist at the Institute of HeartMath in Boulder Creek, Calif. **Bob Barrios-Choplin** is visiting assistant professor of management in the Department of Systems Management, US Naval Postgraduate School, Monterey, Calif.

This study investigated the impact of different types of music on tension, mood, and mental clarity. A total of 144 subjects completed a psychological profile before and after listening for 15 minutes to four types of music (grunge rock, classical, New Age, and designer). With grunge rock music, significant increases were found in hostility, sadness, tension, and fatigue, and significant reductions were observed in caring, relaxation, mental clarity, and vigor. In contrast, after listening to the designer music (music designed to have specific effects on the listener), significant increases in caring, relaxation, mental clarity, and vigor were measured; significant decreases were found in hostility, fatigue, sadness, and tension. The results for New Age and classical music were mixed. Feeling shifts among subjects were observed with all types of music. Designer music was most effective in increasing positive feelings and decreasing negative feelings. Results suggest that designer music may be useful in the treatment of tension, mental distraction, and negative moods. (Altern Ther Health Med. 1998;4(1):75-84)

A number of studies[1-10] have shown that music affects emotions and mood states as well as performance. Other studies have demonstrated the effect of music on physiological measures such as galvanic skin response,[11,12] vasoconstriction,[13] muscle tension,[14,15] immune system function,[16-18] respiration rate,[19,20] heart rate variability,[16] pulse rate, and blood pressure.[20] Music has been used to facilitate anesthesia during pregnancy and labor,[21] reduce stress and discomfort associated with surgical and dental procedures,[22-25] relieve anxiety and depression in coronary care units, and promote recovery from heart attacks.[7,8] It also has been shown[26] that listening to different types of music can lower levels of the stress hormones cortisol, adrenaline, and noradrenaline, and increase levels of atrial natriuretic peptide, a potent antihypertensive hormone produced by the atria of the heart.

Brain anatomy researchers have postulated that music affects brain function in at least two ways: it acts as a nonverbal medium that can move through the auditory cortex directly to the limbic system (an important part of the emotional response system); and it may stimulate release of endorphins, thereby allowing these polypeptides to act on specific brain receptors. This theory is supported by direct recording of neuronal discharge rates while listening to music.[27]

It is well recognized that mental and emotional activity can alter autonomic nervous system (ANS) function.[28,29] Similarly, it has been shown that the ANS profoundly affects cardiovascular,[30] neuroendocrine,[31] and immune system function.[32] It has been suggested that the immunosuppression known to occur during negative emotional states such as bereavement, depression,[33,34] or anger,[35] and the immunoenhancement associated with positive emotional states[35,36] such as care and compassion may be mediated, in part, by the ANS.[37]

Because music can alter mood and emotional states,[1,3-5] it is likely that the immune and hormonal changes seen after subjects listen to music are mediated by the ANS. The Institute of HeartMath (IHM) previously investigated the effects of music on autonomic activity, using power spectral density analysis of heart rate variability, and on immunity, measuring levels of secretory IgA from saliva samples.[16] This work demonstrated a relationship between increased autonomic activity and increased salivary IgA. The interaction of mood, immunity, and autonomic function has been highlighted in a number of studies showing that anger and hostility increase sympathetic activity[28,29,38] and suppress immunity,[35,39] whereas positive emotional states such as appreciation enhance parasympathetic activity[29] and boost immunity.[35,40]

The term "designer music" was introduced by the music industry to describe a new genre of music designed to affect the listener in specific ways. The term has been used in the scientific literature to specify this type of music.[16] Research and clinical studies have shown that designer music produces significant effects in listeners' physiological and psychological status.[41] For example, Medical Resonance Therapy Music® (MicroMusic-Laboratories), composed by Peter Hübner, is designed to affect the brain by activating and strengthening the body's natural

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regenerative processes.[42] Jeffrey Thompson's Brainwave Suite (The Relaxation Company, Acoustic Research Series™) uses sound frequency patterns built into musical soundtracks to stimulate brainwave frequencies associated with specfic states of mind (eg, alert relaxation, creativity and inspiration, rejuvenating sleep, and so on).

Doc Lew Childre, the composer of the designer music used in this study, has produced several designer music releases intended to improve listeners' mental and emotional states and to enhance ANS function and balance. One of Childre's previous musical works, *Heart Zones* (Planetary Publications), was shown to produce greater autonomic activation and larger increases in humoral immunity than other forms of music.[16] The designer music investigated in the present study was titled *Speed of Balance—A Musical Adventure for Emotional & Mental Regeneration* (Planetary Publications). Childre describes this work as "a musical tool useful for enhancing emotional balance, creativity, clear decision making and boosting physical energy."[43] These effects are associated with increased physiological coherence and ANS balance, as described in detail elsewhere.[44] In a recent study,[45] *Speed of Balance* was used to facilitate a new emotional management intervention. After 1 month of regular practice with the intervention, a 100% increase in subjects' dihydroepiandrosterone (DHEA) levels, a 23% decrease in cortisol levels, and positive shifts in ANS balance were measured.

These studies point to a clear relationship between music and feelings, as well as music and physiological responses. Other research indicates that shifts in feelings are linked to physiological responses that may affect health.[29,44] In the present study, we sought to determine how different types of music affect the same individual and to investigate the effects of designer music on mood, tension, and mental clarity.

HYPOTHESES

Hypothesis 1: All four types of music will affect feelings.

Hypothesis 2: Grunge rock music will heighten negative feelings.

Hypothesis 3: Designer music will heighten positive feelings and lower tension and negative feelings.

Hypothesis 4: Teenagers will be less positively affected by classical music and less negatively affected by grunge rock music than will adults.

METHODS

We compared the effects of three different types of music—grunge rock, New Age, and classical—with a relatively new type of music called designer music, which is created with the goal of producing a positive effect on mood, tension, and mental clarity.

SUBJECTS

The subjects included 50 males and 94 females (N=144; mean age, 38; age range, 12–76 years). Adult subjects (n=106; mean age, 46; age range, 25–76 years) included members of seven church study groups located in different cities in the United States (n=67) and a group of volunteers drawn from the community of Boulder Creek, Calif, and IHM (n=39; mean age, 42; age range 25–59 years). Teenage subjects (n=38; mean age, 14; age range, 12–17 years) were recruited from a group attending a local summer camp.

Members of the seven church study groups, located in Atlanta, Ga (n=10), Spokane, Wash (n=6), Los Angeles, Calif (n=11), Memphis, Tenn (n=15), Gaithersburg, Md (n=30), Bellevue, Wash (n=15), and Beaverton, Ore (n=6), were tested at the homes or church facilities at which their meetings were usually held. One member from each church group volunteered to act as the study coordinator for that group. Study coordinators were sent audiotapes of the music to be played and a standardized protocol for conducting the listening sessions. Study coordinators were not included among the subjects analyzed. The Boulder Creek, Calif, community volunteers and the teenagers were tested as two separate groups at the HeartMath Research Center by the authors.

DESIGN

The effects of the four categories of music on tension, mood, and mental clarity were assessed in a crossover design in which subjects acted as their own controls. Study participants and study coordinators were unaware of the specific aims of the study and of the predicted effects of the different types of music. They also were not told the category name of any of the music selections. Each group listened to music from each category for 15 minutes, with a week between listening sessions. The order in which the types of music were heard was randomly assigned among the different groups.

The standardized protocol for conducting the listening sessions both at the HeartMath Research Center and at the other study sites was as follows: once all the participants were seated, the study coordinator handed out a questionnaire designed to assess mood, tension, and mental clarity. Participants were instructed to complete all the questions on the side labeled Part One and asked to be as honest as they could in answering the questions. Next, subjects were told that they would be listening to 15 minutes of music.

Study coordinators were given the following instructions: "It is important that the environment be as close to the same as possible for each listening. In other words, the music should always be listened to in the same room with the same lighting and close to the same temperature, and the music should be played at the same volume and on the same stereo system. The volume should be loud enough so that the music is the predominant focus in the room (conversation would be difficult) but not so loud as to be uncomfortable. Please use as high a quality stereo system as possible."

Before the music was played, the study coordinator instructed the subjects as follows: "Sit quietly and listen to the music without distracting one another. Listen in a casual, relaxed way, but try to avoid falling asleep. Allow the music to take you wherever it takes you in regards to your moods, feelings, memories,

sensations, etc." Immediately after the music was over, participants were instructed to turn over the questionnaire and complete the side labeled Part Two. All data analysis was conducted at the HeartMath Research Center.

MUSIC SELECTIONS

Music selections in the grunge rock and New Age categories were based on popularity, determined by sales as reported in *Billboard Magazine* at the time of the study. Compositions by Mozart were selected for the classical music used in this study because of his fame and general popularity.

The classical selections were Mozart's Six German Dances (Nos. 1-3), K 509, and Piano Concerto in D minor, K 466; 1st movement, from *Amadeus, Original Soundtrack Recording, Volume 2* (Fantasy, Inc). The German Dances, a work for chamber orchestra, is set in a lively triple meter; the bright, consonant melodic line, modulating smoothly through several major keys, is carried mainly by violins and high-pitched woodwinds. The first movement of the Piano Concerto is characterized by highly contrasting dynamics and chromatic harmonies, which give the piece a dramatic and powerful overall feel. Solo piano passages alternate with full orchestral sections, and passionate themes in D minor are punctuated by more light-hearted melodies in F major.

The grunge rock selections were "Last Exit," "Spin the Black Circle," "Not for You," and "Tremor Christ," from Pearl Jam's *Vitalogy* (Epic). The main sounds heard in this music are solo male vocals, half-sung and half-screamed or shouted, electric guitar, and heavy percussion. The selections are characterized as generally loud, with little dynamic variation; most have a heavy, pounding beat emphasized by drums and repeating bass lines. Tempos range from moderate to extremely fast. Some selections are primarily dissonant, while others have more clearly distinguishable, simple chord progressions and melodic lines.

The New Age music selections used were "How Can I Keep From Singing?," "Marble Halls," "Afer Ventus," and "Smaointe..." from Enya's *Shepherd Moons* (Reprise Records). Generally, this music is characterized by very basic, tonal melodies in major keys sung softly by a solo female vocalist, accompanied by sustained, synthesized tones, including muted organ and airy choral sounds. Sustained diatonic block chords or gentle arpeggios create the bass lines. Slow and sometimes freely flowing tempos, abundant use of echoes, little dynamic contrast, and lack of percussion give the music an overall gentle, dreamy feeling.

The designer music selections used were "Street Sax," "Cappuccino—A Way to Start the Day," "Global Anthem," "Intentional Yet Sensitive," and "Heart March," from *Speed of Balance,* an instrumental composition performed by Childre with multiple synthesizers. In general, the music has an upbeat and lighthearted feel. It is easy to listen to because it does not demand a lot of mind focus or concentration. The individual songs are tied together more by their overall intent than by any single musical style. Some have a steady percussion beat and bass accompaniment, repeating melodic themes and chord patterns, while others are far less structured rhythmically and melodically. Some selections use primarily clear, consonant harmonies; others incorporate more dissonant tone combinations. In general, the use of straight major or minor chords is avoided in favor of the more open sounds of major and minor sixth, seventh, and ninth chords. The interval of the perfect fourth underlying many of the harmonies and melodic lines is sometimes heard clearly, other times less so. Generally, the dynamic level is constant within each song and from song to song.

Selections within each of the four music categories were recorded onto audiotapes in the order listed above. The target time for the total duration of the music in each category was 15 minutes, but because the length of selections varied and the authors wished to include selections in their entirety, the actual listening times for the four music categories varied. Listening times were as follows: classical, 15:02; grunge rock, 15:38; New Age, 18:32; and designer, 15:55 (mean=16:17).

MEASURES

Participants completed a 45-item questionnaire, the Personal Feelings Survey (PFS), created specifically for this study by two of the study's authors (BB-C, MA). The stem questionnaire item was, "Please indicate how you feel now by circling the appropriate number following each item below." Five response choices ranged from "not at all" to "intensely." Parts one and two of the questionnaire, which participants completed before and after listening to the music selections (respectively), consisted of the same questions listed in different order on either side.

The objective was to measure mood states, mental clarity, tension, and caring before and after each of the four 15-minute listening sessions. The researchers felt it was crucial to limit the questionnaire to one page that could be completed quickly, before potential internal or external distractions significantly altered the mood that had been created by the music. No single survey instrument was available that could meet this requirement. Therefore, it was decided to create an instrument that used adjective descriptors. Other similar questionnaires include the Affects Balance Scale (Clinical Psychometric Research, Inc, Riderwood, Md) and the Profile of Mood States (EdiTS/Educational and Industrial Testing Service, San Diego, Calif). However, these instruments were not appropriate for this study for several reasons: because they are too long; they were developed primarily in clinical settings (whereas this study had a "healthy" sample); and they measure moods experienced up to a week previously, whereas this study focused on how participants felt at the time of measurement. The PFS includes many of the adjective descriptors used in the questionnaires mentioned above. Adjective scales have the additional advantage of a high face validity compared with full sentence scales. To guard against other forms of response set bias, the items were randomly ordered and the valences reversed (sometimes a response of 5 was positive, sometimes negative).

Regarding the measurement of tension, many extensive surveys measure various aspects of stress, eg, Brief Symptom

Inventory (National Computer Systems, Minnetonka, Minn) and State-Trait Anxiety Inventory (Consulting Psychologists Press, Inc, Palo Alto, Calif); however, these were too long to meet our one-page requirement.

As suggested by Kline,[46] this study followed the theoretical and empirical work of Watson and Tellegen[47] in defining dimensions of mood represented by adjectives. They developed a two-factor structure of mood: "positive affect" and "negative affect." Although the terms positive affect and negative affect might suggest that these mood factors are opposites (that is, negatively correlated), they are in fact independent, uncorrelated dimensions. Following these authors, we chose "vigorous" to represent high positive affect, "fatigued" to represent low positive affect, "hostile" to represent high negative affect, and "relaxed" to represent low negative affect. Additionally, on a quadrant to the two main factors is an axis that Watson and Tellegen term "pleasantness." To represent the end points of this dimension, we chose the terms "happy" to represent pleasant and "sad" to represent unpleasant. The three nonmood constructs measured were the cognitive element mental clarity, the physiological element tension, and the trait disposition caring.

One adjective representing each of the nine constructs was entered into the thesaurus of a word processing software program (WordPerfect 6.0, Orem, Utah), and from the choices offered, four synonyms were selected to form a five-item scale, as follows: vigor (active, energetic, lively, vigorous, dynamic), fatigue (fatigued, exhausted, weary, listless, burned out), relaxation (relaxed, calm, serene, tranquil, peaceful), happiness (happy, joyous, jubilant, elated, delighted), sadness (unhappy, sad, depressed, blue, gloomy), hostility (angry, mad, irritated, peeved, annoyed), tension (nervous, tense, jittery, edgy, anxious), mental clarity (clear-headed, focused, purposeful, alert, keen), and caring (caring, loving, warmhearted, affectionate, kind).

The 30 mood adjectives were next subjected to factor analysis for confirmation of the underlying structure. Results are displayed in Table 1. Factor 1 represents a combination of the items predicted by the researchers to represent two constructs, high positive affect (vigor) and high pleasantness (happiness). However, these items loaded on the same factor, most likely due to the selection of certain synonyms for happy that also represented high vigor, such as elated and joyous. The result is that, in this study, the high end point of the pleasantness dimension is not represented, while factor 1 represents "vigor," which is the high end point of the positive affect dimension. Factor 2 represents "relaxation," which is the low end point of the negative affect dimension. Factor 3 represents "hostility," which is the high end point of the negative affect dimension. Factor 4 represents "fatigue," which is the low end point of the positive affect dimension. Finally, factor 5 represents "sadness," which is the low end point of the pleasantness dimension.

The items loading on these five mood factors (plus five items each representing tension, mental clarity, and caring) were formed into scales and subjected to analysis to determine internal consistency reliability (unhappy was excluded due to high loadings on two factors). All scales exceeded the .70 minimum suggested by Nunnally.[48] The reliability results were as follows: vigor, α=.95; relaxation, α=.92; hostility, α=.90; fatigue, α=.89; sadness, α=.89; mental clarity, α=.89; caring, α=.94; and tension, α=.88. Table 2 contains means, standard deviations, and correlations for the eight scales used in the survey.

TABLE 1 Factor analysis

	Factors				
Items	**1**	**2**	**3**	**4**	**5**
Lively	**0.86**	0.06	-0.04	-0.20	-0.07
Energetic	**0.80**	0.11	-0.05	-0.27	-0.07
Vigorous	**0.80**	0.11	0.05	-0.06	-0.12
Active	**0.80**	0.08	0.00	-0.26	-0.10
Dynamic	**0.80**	0.20	0.01	-0.19	-0.11
Jubilant	**0.79**	0.27	-0.12	-0.06	-0.05
Elated	**0.78**	0.29	-0.10	-0.02	-0.05
Delighted	**0.76**	0.33	-0.21	-0.10	-0.07
Joyous	**0.73**	0.34	-0.22	-0.10	-0.05
Happy	**0.66**	0.39	-0.22	-0.14	-0.18
Calm	0.19	**0.83**	-0.20	-0.04	-0.02
Relaxed	0.23	**0.82**	-0.16	-0.05	-0.07
Tranquil	0.27	**0.82**	-0.15	-0.03	-0.11
Peaceful	0.33	**0.78**	-0.23	-0.07	-0.11
Serene	0.37	**0.74**	-0.07	-0.02	-0.02
Peeved	-0.08	-0.17	**0.81**	0.21	0.11
Annoyed	-0.12	-0.19	**0.81**	0.19	0.24
Angry	-0.07	-0.16	**0.75**	0.13	0.37
Mad	-0.06	-0.13	**0.75**	0.16	0.39
Irritated	-0.11	-0.24	**0.72**	0.23	0.21
Exhausted	-0.13	-0.09	0.12	**0.86**	0.08
Fatigued	-0.18	-0.01	0.13	**0.82**	0.18
Weary	-0.24	0.00	0.25	**0.75**	0.20
Burned out	-0.16	-0.08	0.23	**0.71**	0.27
Listless	-0.20	-0.03	0.16	**0.65**	0.21
Blue	-0.15	-0.09	0.24	0.21	**0.83**
Sad	-0.15	-0.04	0.27	0.24	**0.78**
Gloomy	-0.10	-0.11	0.28	0.25	**0.74**
Depressed	-0.13	-0.08	0.37	0.26	**0.72**
Eigenvalue	11.60	4.40	2.76	1.42	1.05
Percentage of variance	40.0	15.2	9.5	4.9	3.6

RESULTS

Analysis of the entire sample will be reported first, followed by analyses of the adult and teenage subgroups. Two-tailed paired *t* tests were used to compare pretest and posttest

TABLE 2 Means, standard deviations, and correlations (N=144)

		Means	SD	1	2	3	4	5	6	7
1	Caring	3.20	0.72							
2	Mental clarity	2.86	0.89	0.72						
3	Relaxation	3.07	0.95	0.71	0.65					
4	Vigor	2.56	0.91	0.68	0.78	0.58				
5	Hostility	1.39	0.70	-0.33	-0.29	-0.43	-0.32			
6	Fatigue	1.86	0.87	-0.25	-0.42	-0.22	-0.43	0.50		
7	Sadness	1.36	0.65	-0.21	-0.28	-0.28	-0.34	0.65	0.57	
8	Tension	1.56	0.72	-0.23	-0.25	-0.45	-0.24	0.77	0.51	0.64

differences in means for each scale. Descriptive statistics for the entire sample are displayed in Table 3.

Hypothesis 1 was supported. Shifts in feelings were observed with each type of music, with interesting differences in patterns (see Figure). When the entire sample was analyzed, a significant reduction in tension was observed after subjects listened to classical music ($P<.01$). No other feelings changed significantly between pretests and posttests with classical music. With New Age music, a significant increase in relaxation ($P<.001$) and significant reductions in hostility ($P<.001$) and tension ($P<.001$) were observed. However, significant reductions in mental clarity ($P<.01$) and vigor ($P<.001$) were also observed with this music.

Hypothesis 2 was supported. Following the grunge rock music, there were significant increases in hostility ($P<.001$), fatigue ($P<.01$), sadness ($P<.001$), and tension ($P<.001$). Significant reductions were observed in caring ($P<.001$), relaxation ($P<.001$), mental clarity ($P<.001$), and vigor ($P<.001$).

Hypothesis 3 was supported. Following the designer music, significant increases in caring ($P<.001$), relaxation ($P<.001$), mental clarity ($P<.001$), and vigor ($P<.01$) were measured, and there were significant decreases in hostility ($P<.05$), fatigue ($P<.001$), sadness ($P<.001$), and tension ($P<.001$).

Adult Subgroup

Descriptive statistics for the adult subgroup are displayed in Table 4. In this subgroup, significant reductions in fatigue ($P<.001$), sadness ($P<.05$), and tension ($P<.05$) were measured following the classical music. With New Age music, there was a significant increase in relaxation ($P<.001$) as well as reductions in mental clarity ($P<.01$), vigor ($P<.01$), hostility ($P<.001$), and tension ($P<.001$). With the grunge rock music, there were significant increases in hostility ($P<.001$), fatigue ($P<.01$), sadness ($P<.001$), and tension ($P<.001$). Decreases were observed in caring ($P<.001$), relaxation ($P<.001$), mental clarity ($P<.001$), and vigor ($P<.001$). After subjects listened to the designer music, there were significant increases in caring ($P<.01$), relaxation ($P<.001$), mental clarity ($P<.01$), and vigor ($P<.01$). Decreases in hostility ($P<.05$), fatigue ($P<.001$), sadness ($P<.01$), and tension ($P<.001$) also were measured.

Teenage subgroup

Descriptive statistics for the teenage subgroup are shown in Table 5. The only significant change observed in this subgroup after listening to classical music was a reduction in vigor ($P<.05$). With New Age music, significant increases in fatigue ($P<.05$) and relaxation ($P<.05$) were seen. There also was a significant reduction in vigor ($P<.01$).

Following the grunge rock music, there were significant increases in hostility ($P<.001$) and tension ($P<.01$), and significant decreases in caring ($P<.01$), relaxation ($P<.001$), mental clarity ($P<.05$), and vigor ($P<.01$).

After subjects listened to designer music, on the other hand, a significant increase in relaxation ($P<.05$) and a significant reduction in sadness ($P<.05$) were seen.

Hypothesis 4 was partially supported. To test Hypothesis 4, single factor analysis of variance (ANOVA) was used to test for differences between adult and teenage scores (pretest and posttest) for each scale and for each category of music. In the classical music category there were a number of significant differences. Vigor decreased in the teenage subgroup and increased in the adult subgroup ($P<.01$), fatigue was increased in the teens and lowered in the adults ($P<.05$), and sadness was increased in the teens and decreased in the adults ($P<.05$).

In the New Age music category, adults had a decrease in fatigue, whereas fatigue increased among the teens, resulting in a significant difference ($P<.05$). The only significant difference in the adults' and teens' response to grunge rock music was that the reduction in caring was greater ($P<.05$) in adults than in teens. There were no significant differences between the adults' and teenagers' response to designer music.

DISCUSSION

Our thesis is that the autonomic, immune, and neuroendocrine changes observed in other studies in response to listening to music are mainly triggered by changes in affective and psychological states, and that these states can be favorably altered by certain types of music.

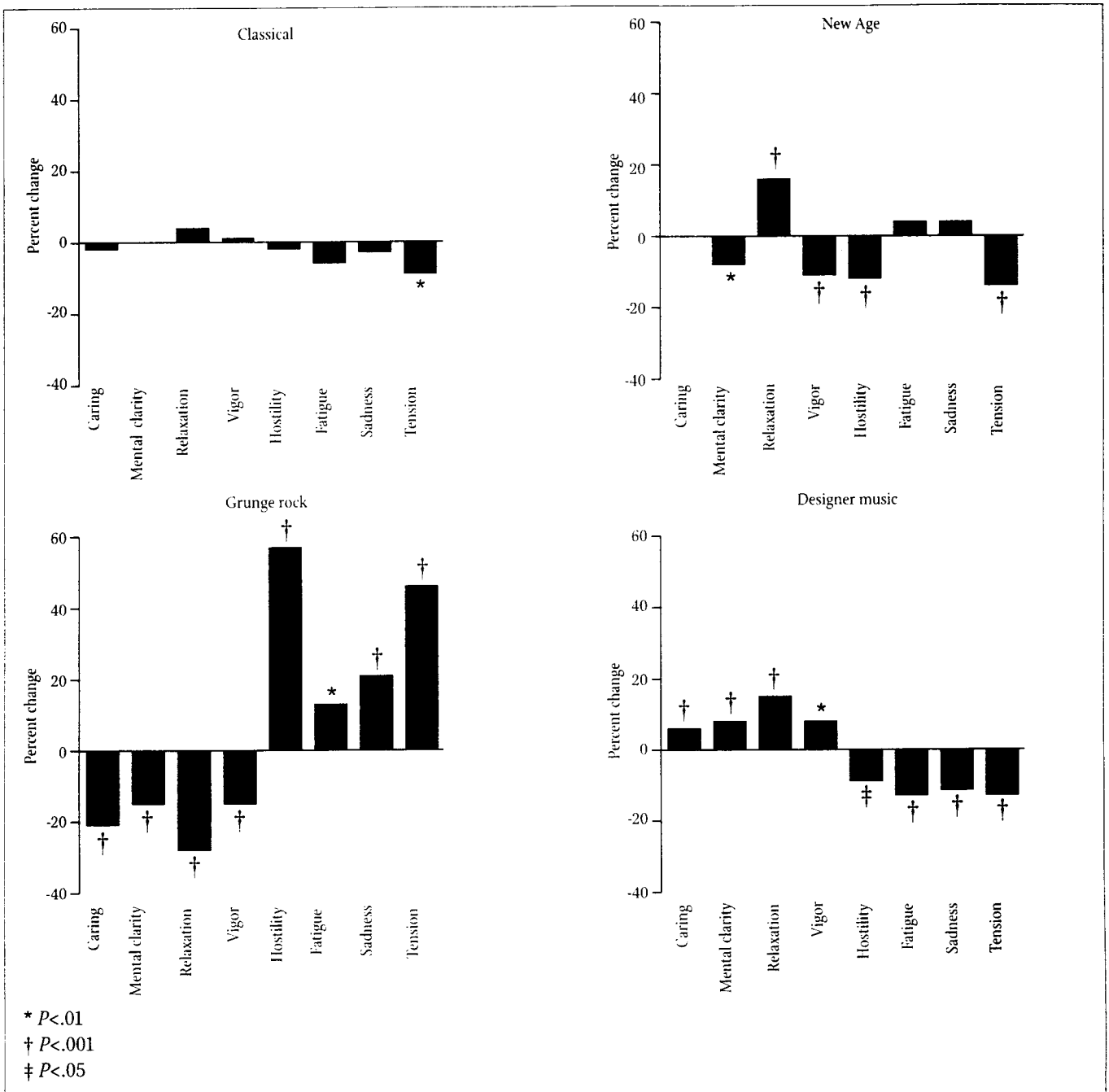
Classical music has been used in a number of studies,[7,8] many of which have shown that it reduces anxiety and depression. A recent study[6] reported that subjects' spatial task performance was

TABLE 3 Descriptive statistics for the entire sample (N=144)

Classical	Pre	SD	Post	SD	*t*	*df*	*P*<
Caring	3.35	0.79	3.28	0.92	1.15	126	NS
Mental clarity	3.00	0.79	2.99	0.96	0.19	126	NS
Relaxation	3.12	0.79	3.26	0.99	-1.85	126	NS
Vigor	2.69	0.88	2.70	0.96	-0.11	126	NS
Hostility	1.31	0.58	1.28	0.55	0.62	126	NS
Fatigue	1.93	0.89	1.81	0.95	1.57	126	NS
Sadness	1.33	0.64	1.29	0.62	0.89	126	NS
Tension	1.59	0.61	1.45	0.69	2.92	126	.01
New Age							
Caring	3.26	0.92	3.25	0.98	0.22	135	NS
Mental clarity	2.96	0.84	2.73	0.97	3.2	135	.01
Relaxation	3.06	0.89	3.54	0.93	-6.43	135	.001
Vigor	2.63	0.93	2.35	0.94	4.16	135	.001
Hostility	1.39	0.65	1.22	0.43	3.46	135	.001
Fatigue	1.84	0.80	1.92	0.87	-1.25	135	NS
Sadness	1.36	0.63	1.42	0.66	-1.46	135	NS
Tension	1.54	0.68	1.33	0.51	4.38	135	.001
Grunge rock							
Caring	3.32	0.90	2.61	1.07	9.1	140	.001
Mental clarity	2.98	0.85	2.54	0.92	5.44	140	.001
Relaxation	3.17	0.81	2.28	1.01	10.06	140	.001
Vigor	2.66	0.88	2.26	0.93	5.22	140	.001
Hostility	1.28	0.60	2.01	1.10	-8.08	140	.001
Fatigue	1.88	0.95	2.13	0.96	-2.94	140	.01
Sadness	1.32	0.65	1.60	0.81	-3.84	140	.001
Tension	1.47	0.69	2.15	0.99	-7.58	140	.001
Designer music							
Caring	3.17	0.88	3.37	0.88	-3.26	143	.001
Mental clarity	2.78	0.79	3.00	0.85	-3.31	143	.001
Relaxation	2.95	0.81	3.39	0.89	-6.49	143	.001
Vigor	2.52	0.83	2.73	0.83	-2.96	143	.01
Hostility	1.39	0.68	1.26	0.46	2.58	143	.05
Fatigue	1.86	0.86	1.61	0.75	5.07	143	.001
Sadness	1.36	0.64	1.22	0.48	3.36	143	.001
Tension	1.53	0.61	1.33	0.52	4.21	143	.001

enhanced when preceded by a Mozart sonata as compared with silence or relaxation conditions. Another study,[49] primarily employing classical music, examined the effects of music on surgeons' performance. The results showed that when the surgeons enjoyed the music, autonomic reactivity was reduced and performance improved. In the present study, classical music led to a general reduction in the "negative" scales, with significant reductions in fatigue, sadness, and tension, and no significant differences in the "positive" scales in the adult subgroup. However, in the teenage subgroup there was a reduction in vigor with no significant decreases in negative affect. When the two groups were analyzed as a whole, the only significant effect was a decrease in tension, which was mainly due to the decreases in the adult subgroup. This seems to confirm a common perception that teens find classical music less enjoyable than do adults.

New Age music is generally believed to promote a relaxed, peaceful state, though little data are available on its effects. In a study that examined the effects of different types of music on autonomic activity and immunity,[16] New Age music did not produce any significant effects. However, New Age music has been shown to facilitate sleep in elderly individuals with sleep disturbances.[50] Music that has intentions or effects on the listener similar to that of New Age music, also referred to in the literature as "relaxation" or "sedative" music, has produced mixed results.[51,52] In the present study, New Age music led to an increase in relaxation and a decrease in tension. However, there was also a



Effects of different types of music on all subjects. Percent change in affective measures as reported in the Personal Feelings Survey for the entire sample (N=144) after listening for 15 minutes to classical, New Age, grunge rock, and designer music selections.

decrease in caring, mental clarity, and vigor. New Age music had virtually the same effects on both teenage and adult subjects. The only significant difference was in the fatigue scale: teenagers felt more fatigued after listening to New Age music; the adult group experienced no change.

There is also a paucity of data on the effects of listening to rock music. One recent study[9] examining the effects of rock and heavy metal music on adolescent psychiatric patients found that among subjects who preferred heavy metal, this type of music produced a short-term increase in positive affect. Another study[10] showed that when the subject likes the music, there is a higher likelihood of its invoking a positive affect state. In the

TABLE 4 Descriptive statistics for the adult sample (N=106)

Classical	Pre	SD	Post	SD	*t*	*df*	*P*<
Caring	3.41	0.79	3.39	0.84	0.33	94	NS
Mental clarity	3.05	0.76	3.10	0.89	-0.74	94	NS
Relaxation	3.12	0.82	3.27	0.94	-1.87	94	NS
Vigor	2.57	0.85	2.71	0.93	-1.73	94	NS
Hostility	1.27	0.55	1.19	0.43	1.46	94	NS
Fatigue	1.80	0.77	1.58	0.66	3.54	94	.001
Sadness	1.29	0.59	1.19	0.44	2.16	94	.05
Tension	1.47	0.51	1.33	0.50	2.49	94	.05
New Age							
Caring	3.35	0.86	3.31	0.90	0.6	98	NS
Mental clarity	3.05	0.79	2.80	0.92	3.09	98	.01
Relaxation	3.07	0.87	3.57	0.88	-5.97	98	.001
Vigor	2.54	0.91	2.29	0.94	3.19	98	.01
Hostility	1.40	0.63	1.19	0.41	3.58	98	.001
Fatigue	1.86	0.80	1.86	0.86	0.06	98	NS
Sadness	1.40	0.65	1.46	0.65	-0.97	98	NS
Tension	1.59	0.67	1.34	0.52	4.36	98	.001
Grunge rock							
Caring	3.45	0.81	2.63	1.02	8.74	103	.001
Mental clarity	3.09	0.83	2.59	0.91	5.02	103	.001
Relaxation	3.19	0.82	2.26	0.96	8.81	103	.001
Vigor	2.61	0.88	2.19	0.91	4.45	103	.001
Hostility	1.26	0.54	2.00	1.04	-6.97	103	.001
Fatigue	1.80	0.89	2.11	0.98	-3.02	103	.01
Sadness	1.31	0.60	1.59	0.77	-3.55	103	.001
Tension	1.45	0.63	2.19	0.98	-6.85	103	.001
Designer music							
Caring	3.30	0.77	3.53	0.79	-3.0	105	.01
Mental clarity	2.92	0.70	3.19	0.82	-3.2	105	.01
Relaxation	3.01	0.73	3.51	0.82	-6.15	105	.001
Vigor	2.54	0.83	2.80	0.83	-3.15	105	.01
Hostility	1.36	0.65	1.24	0.46	1.99	105	.05
Fatigue	1.84	0.84	1.54	0.70	4.92	105	.001
Sadness	1.34	0.62	1.19	0.39	2.88	105	.01
Tension	1.54	0.61	1.32	0.50	3.84	105	.001

present study, following the grunge rock music, a decrease in all categories of positive effects and an increase in all categories of negative effects were measured in the adult group and similar results were seen in the teenage group. The only significant difference, however, was that the adult group had a greater reduction in caring than the teenagers.

The grunge rock used in this study is quite different from rock music in general, and it is highly unlikely that all forms of rock music would produce similar results. Although many teenagers say they like grunge rock, in this study—as with the adults—the teenagers still showed a significant increase in the negative effects, such as hostility and tension, and a significant decrease in the positive effects, caring, relaxation, mental clarity, and vigor. Whereas teenagers apparently enjoy listening to grunge rock, it is not clear whether they do so because of or despite the negative feeling states provoked by this music. One explanation is the fact that increased anger causes increased sympathetic stimulation,[29] which in turn heightens levels of cortisol and other adrenal steroids. This produces a momentary high followed by negative psychological aftereffects. The stimulating experience of this initial high could account for teenagers' enjoyment of this type of music.

The term "designer music" was coined by the music industry to describe a type of music intentionally designed to have specific effects on listeners. *Speed of Balance*, the designer music recording used in the present study, is intended to "facilitate mental and emotional balance so that people can experience clearer and more positive perceptions."[45] It is well established

TABLE 5 Descriptive statistics for the teenage sample (N=38)

Classical	Pre	SD	Post	SD	*t*	*df*	*P*<
Caring	3.16	0.79	2.95	1.08	1.50	31	NS
Mental clarity	2.85	0.85	2.65	1.09	1.34	31	NS
Relaxation	3.13	0.72	3.22	1.12	-0.54	31	NS
Vigor	3.03	0.90	2.66	1.06	2.15	31	.05
Hostility	1.42	0.66	1.54	0.78	-1.14	31	NS
Fatigue	2.31	1.12	2.49	1.29	-0.79	31	NS
Sadness	1.44	0.77	1.55	0.94	-0.92	31	NS
Tension	1.97	0.73	1.78	1.01	1.54	31	NS
New Age							
Caring	3.03	1.03	3.10	1.17	-0.56	36	NS
Mental clarity	2.71	0.92	2.54	1.07	1.14	36	NS
Relaxation	3.02	0.96	3.46	1.07	-2.68	36	.05
Vigor	2.86	0.96	2.51	0.95	2.72	36	.01
Hostility	1.39	0.72	1.29	0.49	0.94	36	NS
Fatigue	1.77	0.81	2.08	0.90	-2.17	36	.05
Sadness	1.24	0.58	1.33	0.69	-1.77	36	NS
Tension	1.40	0.69	1.30	0.49	1.18	36	NS
Grunge rock							
Caring	2.96	1.06	2.56	1.21	3.19	36	.01
Mental clarity	2.67	0.84	2.42	0.95	2.17	36	.05
Relaxation	3.10	0.80	2.34	1.15	4.85	36	.001
Vigor	2.78	0.88	2.45	0.99	2.87	36	.01
Hostility	1.32	0.75	2.04	1.25	-4.03	36	.001
Fatigue	2.09	1.10	2.18	0.93	-0.61	36	NS
Sadness	1.35	0.80	1.60	0.93	-1.60	36	NS
Tension	1.53	0.85	2.05	1.02	-3.28	36	.01
Designer music							
Caring	2.80	1.08	2.91	0.97	-1.29	37	NS
Mental clarity	2.38	0.90	2.48	0.72	-0.97	37	NS
Relaxation	2.78	0.97	3.06	0.99	-2.32	37	.05
Vigor	2.49	0.83	2.51	0.81	-0.22	37	NS
Hostility	1.46	0.77	1.31	0.45	1.83	37	NS
Fatigue	1.91	0.94	1.80	0.85	1.49	37	NS
Sadness	1.39	0.71	1.30	0.66	2.16	37	.05
Tension	1.48	0.63	1.37	0.59	1.77	37	NS

that emotion alters ANS activity and that different types of music alter neuronal discharge rates,[27] hormonal balance,[26] and mood differently. It has been previously demonstrated[16] that listening to designer music leads to greater shifts in autonomic activity and larger increases in humoral immunity compared with other forms of contemporary music.

In the present study, the designer music had the greatest and most favorable effects on the listeners. In the full sample, all positive scales (caring, relaxation, mental clarity, and vigor) increased, while all negative scales (tension, hostility, fatigue, and sadness) decreased. These results suggest that the positive shifts in ANS activity, immune function, and cortisol/DHEA ratio measured in previous studies employing designer music[16,43] derive from changes produced in subjects' feeling states.

It is possible that subjects' personal tastes in music as well as popularized opinions concerning the beneficial or detrimental effects of different musical genres may have led to expectancy effects, which could have influenced these results. However, given the diverse subject population, effects of this kind would tend to average out across the different types of music.

CONCLUSION

This study presents a rationale for the use of music—and designer music in particular—to reduce stress, fatigue, and negative affect, and to enhance emotional well-being and mental clarity. This study also poses a new direction for research on the use of designer music in the treatment of dysfunctional mental and emotional conditions. Given the connection between attitudes,

emotions, and health, these results indicate that music can be an inexpensive and easy means for facilitating stress reduction.

References

1. Altschuler I. A psychiatrist's experience with music as a therapeutic agent. In: Altschuler I, ed. *Music and Medicine.* New York, NY: Books for Libraries Press; 1948:250-275.
2. Hanser SB, Thompson LW. Effects of a music therapy strategy on depressed older adults. *J Gerontol.* 1994;49(6):265-269.
3. Lenton SR, Martin PR. The contribution of music vs instructions in the musical mood induction procedure. *Behav Res Ther.* 1991;29(6):623-625.
4. Palakanis KC, DeNobile JW, Sweeney WB, Blankenship CL. Effect of music therapy on state anxiety in patients undergoing flexible sigmoidoscopy. *Dis Colon Rectum.* 1994;37:478-481.
5. Updike P, Charles D. Music Rx: physiological and emotional responses to taped music programs of preoperative patients awaiting plastic surgery. *Ann Plast Surg.* 1987;9(1):29-33.
6. Rauscher F, Shaw G, Ky K. Music and spatial task performance. *Nature.* 1993;356:6-11.
7. Guzzetta CE. Effects of relaxation and music therapy on patients in a coronary care unit with presumptive acute myocardial infarction. *Heart Lung.* 1989;18:606-616.
8. Davis-Rollans C. Physiologic responses of coronary care patients to selected music. *Heart Lung.* 1987;16:370-379.
9. Wooten MA. The effects of heavy metal music on affects shifts of adolescents in an inpatient psychiatric setting. *Music Ther Perspect.* 1992;10(2):93-98.
10. Eifert GH, Craill L, Carey E, O'Connor C. Affect modification through evaluative conditioning with music. *Behav Res Ther.* 1988;26(4):321-330.
11. Peretti PO, Swenson K. Effects of music on anxiety as determined by physiological skin responses. *J Res Music Educ.* 1974;22:278-283.
12. Zimny GH, Weidenfeller EW. Effects of music upon GSR of children. *Child Dev.* 1962;33:891-896.
13. Kibler VE, Rider M. Effects of progressive muscle relaxation and music on stress as measured by finger temperature response. *J Clin Psych.* 1983;39(2):213-215.
14. Scartelli JP. The effect of EMG biofeedback and sedative music, EMG biofeedback only, and sedative music only on frontalis muscle relaxation ability. *J Music Ther.* 1984;21(2):67-78.
15. Reynolds SB. Biofeedback, relaxation training and music: homeostasis for coping with stress. *Biofeedback Self Regul.* 1984;9(2):169-177.
16. McCraty R, Atkinson M, Rein G, Watkins AD. Music enhances the effect of positive emotional states on salivary IgA. *Stress Med.* 1996;12:167-175.
17. Rider M. Imagery, improvisation, and immunity. *Psychotherapy.* 1990;17:211-216.
18. Rider MS, Achterberg J, Lawlis GF, et al. Effect of immune system imagery on secretory IgA. *Biofeedback Self Regul.* 1990;15:317-333.
19. Foster E, Gamble EAM. The effect of music on thoracic breathing. *Am J Psychol.* 1906;17:406-416.
20. Webster C. Relaxation, music and cardiology: the physiological and psychological consequences of their interrelation. *Aust Occup Ther J.* 1973;20:9-20.
21. Clark M, McCorkle R, Williams S. Music therapy-assisted labor and delivery. *J Music Ther.* 1981;18(2):88-100.
22. Standley J. Music research in medical/dental treatment: meta-analysis and clinical applications. *J Music Ther.* 1986;23(2):50-55.
23. Shapiro AG, Cohen H. Auxiliary pain relief during suction curettage. In: Shapiro AG, Cohen H, eds. *Musik in der Medizin/Music in Medicine.* Heidelberg, Germany: Springer-Verlag; 1987:227-231.
24. Whipple B, Glynn NJ. Quantification of the effects of listening to music as a non-invasive method of pain control. *Sch Inq Nurs Pract.* 1992;6:43-62.
25. Beck SL. The therapeutic use of music for cancer-related pain. *Oncol Nurs Forum.* 1991;18:1327-1337.
26. Mockel M, Stork T, Vollert J, et al. Stress reduction through listening to music: effects on stress hormones, hemodynamics and mental state in patients with arterial hypertension and in healthy persons. *Dtsch Med Wochenschr.* 1995;120(21):745-752.
27. Creutzfeldt O, Ojemann G. Neuronal activity in the human lateral temporal lobe III: activity changes during music. *Exp Brain Res.* 1989;77:490-498.
28. Kamada T, Miyake S, Kumashiro M, Monou H, Inoue K. Power spectral analysis of heart rate variability in type As and type Bs during mental workload. *Psychosom Med.* 1992;54:462-470.
29. McCraty R, Atkinson M, Tiller WA, Rein G, Watkins A. The effects of emotions on short term heart rate variability using power spectrum analysis. *Am J Cardiol.* 1995;76:1089-1093.
30. Sinha R, Lovallo WR, Parsons OA. Cardiovascular differentiation of emotions. *Psychosom Med.* 1992;54(4):422-435.
31. Lovallo WR, Pincomb GA, Brackett DJ, Wilson MF. Heart rate reactivity as a predictor of neuroendocrine responses to aversive and appetitive challenges. *Psychosom Med.* 1990;52:17-26.
32. Ader R, Felten DL, Cohen N, eds. *Psychoneuroimmunology.* 2nd ed. San Diego, Calif: Academic Press, Inc; 1991.
33. He M. A prospective controlled study of psychosomatic and immunologic changes in recently bereaved people. *Chin J Neurol Psych.* 1993;24:90-93.
34. Shekelle RB, Raynor WJ, Ostfeld AM, et al. Psychological depression and 17-year risk of death from cancer. *Psychosom Med.* 1981;43:117-125.
35. Rein G, McCraty RM, Atkinson M. Effects of positive and negative emotions on salivary IgA. *J Adv Med.* 1995;8(2):87-105.
36. Dillon KM, Minchoff B, Baker KH. Positive emotional states and enhancement of the immune system. *Int J Psychiatry Med.* 1986;15(1):13-16.
37. Watkins AD. Perceptions, emotions and immunity: an integrated homeostatic network. *QJM.* 1995;88:283-294.
38. Sloan RP, Shapiro PA, Bigger JT, et al. Cardiac autonomic control and hostility in healthy subjects. *Am J Cardiol.* 1994;74:298-300.
39. McClelland D, Floor E, Davidson R. Stressed power motivation, sympathetic activation, immune function and illness. *J Human Stress.* 1980;6:11-19.
40. McClelland DC, Kirshnit C. The effects of motivational arousal through films on salivary immunoglobulin A. *Psychol Health.* 1988;2:31-52.
41. *Medical Resonance Therapy Music®—Scientific Research/Clinical Observations.* Edermünde, Germany: AAR Edition–Scientific Information Service; 1996.
42. Hübner P. *The Harmony Laws of Nature in the Microcosm of Music.* Edermünde, Germany: AAR Edition–Scientific Information Service; 1995.
43. Childre DL. *Speed of Balance–A Musical Adventure for Emotional and Mental Regeneration.* Boulder Creek, Calif: Planetary Publications; 1995.
44. Tiller W, McCraty R, Atkinson M. Cardiac coherence: a new noninvasive measure of autonomic system order. *Altern Ther Health Med.* 1996;2(1):52-65.
45. Childre DL. *Cut-Thru.* Boulder Creek, Calif: Planetary Publications; 1996.
46. Kline P. *The Handbook of Psychological Testing.* London, England: Routledge; 1993.
47. Watson D, Tellegen A. Toward a consensual structure of mood. *Psychol Bull.* 1985;98(2):219.
48. Nunnally J. *Psychometric Theory.* New York, NY: McGraw-Hill; 1978.
49. Allen K, Blascovich J. Effects of music on cardiovascular reactivity among surgeons. *JAMA.* 1994;272(1):882-884.
50. Mornhinweg GC, Voignier RR. Music for sleep disturbance in the elderly. *J Holist Nurs.* 1995;13(3):248-254.
51. Smith CA, Morris LW. Effects of stimulative and sedative music on cognitive and emotional components of anxiety. *Psychol Rep.* 1976;38(3):1187-1193.
52. Caspy T, Peleg E, Schlam D, Goldberg J. Sedative and stimulative music effects: differential effects on performance impairment following frustration. *Motivation Emotion.* 1988;12(2):123-138.