

Music and pattern change in chronic pain

The purpose of this study was to investigate the use of music as a unitary–transformative means of altering the perception of chronic pain among women with rheumatoid arthritis within the context of Newman's model of health as expanding consciousness. In this repeated measures investigation, 30 women diagnosed with rheumatoid arthritis for a minimum of 6 months, responded to the McGill Pain Questionnaire prior to listening to music of their choice, during music, and 1 to 2 hours after completing the intervention. Data were analyzed according to the Number of Words Chosen (NWC) and the Pain Rating Index–Rank [PRI(R)] of the McGill Pain Questionnaire. The results of this study support the use of music as a unitary–transformative intervention.

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Music hath charms to soothe a savage breast,
To soften rocks, or bend a knotted oak.^{1(p240)}

—William Congreve

FOR BOTH CHRONIC pain and rheumatoid arthritis there is a connotation of failure to cure. Both terms suggest change in one's pattern of interaction with the environment, particularly in regard to ability for and freedom of physical movement. The quotation illustrates music's ability to influence the mutual process between people and their environment(s), suggesting movement beyond one's present shape, form, or way of being. Music's inherent relationships among temporal, spatial, and movement patterns reflect infinite potential for patterns of person–environment interaction, manifested through unitary, pandimensional musical experiences. The notion of music as a pandimensional phenomenon with inherent movement potential suggests

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possibilities for evolving patterns of person–environment interaction that may facilitate transformation of the “savage breast” and “knotted oak” of rheumatoid arthritis. Newman’s^{2,3} theory of health as expanding consciousness provides a framework for understanding music as a pandimensional phenomenon and vehicle for transformation.

Newman³ postulates that consciousness is a manifestation of an evolving pattern of person–environment interaction. Consciousness is further defined as the informational capacity of the human being, ie, the ability to interact with the environment. According to Newman, consciousness includes the interconnectedness of the entire living system, subsuming cognitive and affective awareness, physiochemical maintenance, growth processes, and the immune system. Newman proposes that this pattern of information is part of a large, undivided pattern of an expanding universe. She further postulates that health and the evolving pattern of consciousness are one and the same, whereby a person is identified by his or her pattern. Each individual’s pattern evolves through various permutations of order and disorder, ie, health and disease. The process is one of increasing complexity, with both health and disease manifestations of the evolving pattern.

Synthesizing Young’s theory of human evolution, Newman² depicts expanding consciousness as beginning with potential consciousness (freedom) and moving through processes of binding in time and centering in space toward a turning point where choice occurs in relation to changes in movement. This turning point of choice/movement enables transcendence of the physical self toward decentering in infinite space and unbinding in timelessness toward

an evolutionary ideal of real freedom/absolute consciousness. Thus, Newman is suggesting that people come into being from a state of potential consciousness, are bound in time, find identity in space, and through movement learn how things work and make choices that ultimately take them beyond space and time to a state of absolute consciousness.

Newman postulates that development of the physical self is necessarily binding in time and space and that movement provides a means of controlling one’s environment. She suggests that as physical disability engenders restriction in body movement, losses of freedom become more apparent. As such, the restrictions in movement/space/time force an awareness that extends beyond the physical self. Newman proposes that such awareness occurs when patterns of interaction that worked in the past are no longer effective. Thus in order to survive, the person seeks new and different answers, reflecting a limitation of self that concurrently becomes a process of inner growth, a transformation.²

Building on Newman’s postulates and incorporating the notions of Prigogine,^{4,5} the process of transformation, or consciousness, can be conceptualized as a dissipative structure.⁶ Consciousness, or the process of transformation, may be considered a primary manifestation of the underlying pattern of the human field, incorporating patterns of time, space, and motion. Time and space are viewed as equivalent phenomena as are motion and perception. Time and space are experienced through motion and perception. Consciousness, or transformation, reflects patterning among time, space, and motion and is manifested through the individual’s mutual process with the environment. Manifest patterns reflect the un-

derlying dissipative structure of consciousness, which changes as perturbations occur within the relationships among temporal, spatial, and motion patterns. Space within consciousness expands with new experiences and knowledge. This expansion generates energy flow, which is manifested through perturbations and the extension of space into time as knowledge and experiences are synthesized. Motion and perception, as equivalent phenomena, reflect awareness of changes in patterns of time and space. Thus, as knowledge and experiences are synthesized, perturbations may be experienced as alterations in thinking, disturbances in space-time sense, changes in body image, distortions of perception, changes in meaning or significance, a sense of the ineffable, feelings of rejuvenation, and hypersuggestibility.^{7,8} A sudden reorganization occurs as the informational capacity of the individual increases in complexity and increasingly diverse patterns of behavior emerge. As the complexity of the dissipative structure increases, energy consumption increases. Perturbations that occur are stronger, thus the fragility of the dissipative structure of consciousness increases. As higher order forms of energy in the form of information occur within the mutual process between person and environment, higher order dissipative structures of consciousness or transformations emerge, and the complexity and diversity of time, space, and motion patterns increase. The individual experiences expanding consciousness, patterns of behavior change and awareness of the pandimensional nature of life emerges.⁶

Within this framework, changes in time-space-motion patterns, ie, patterned environmental resonance, may precipitate a shift in consciousness, a transformation. Perturbations or disruptions in movement patterns

may be expressed through changes in manifest patterns of consciousness. Thus, imposed perturbations or disruptions in patterns of movement via exposure to patterned environmental resonance may be reflected by changes in indicators to consciousness, including perceptual phenomena such as the experience of pain.

Newman³ suggests that recognition of the pattern of a perceptual or movement phenomenon and its action potential provides the framework for nursing practice. Pattern recognition is proposed as essential to the process of evolving to higher levels of consciousness. When it occurs, it makes explicit the possibilities for action. Nursing facilitates this pattern recognition process by rhythmic connecting with people in an authentic way for the purpose of illuminating the pattern and discovering the new rules of a higher level of consciousness.

The experience of chronic pain and its associated restriction of physical movement by people with rheumatoid arthritis illuminates the tenets of the theory. Recognition of an inevitable pattern of intractable pain over the course of one's life may be viewed as a key to higher levels of consciousness rather than as an inability to eliminate a disease process and pain. Realization and integration of the fact that chronic pain is a manifestation of the disease may illuminate the possibilities for action. As Newman states, "It is like the difference between being in the dark and turning on the light: when the light comes on, one can see the possibilities for movement."^{3(p40)} Thus, the pain pattern of rheumatoid arthritis may be viewed as an evolving pattern of the whole, with action potentials to be uncovered.

The use of patterned environmental resonance in the form of music may provide an avenue toward uncovering action potentials

within the pain patterns of individuals with rheumatoid arthritis. In a study comparing the effects of quiet ambient sounds and harmonic sounds of music on the perception of rest, Smith⁹ found that patterned environmental resonance using varied harmonic sounds significantly increased the perception of restedness. A relaxation response to the use of sedative or patterned music has also been described. This relaxation response includes decreases in heart and respiratory rate, muscle relaxation, sleep, decreased oxygen consumption, lowered metabolic rates, and a reduction in circulating corticosteroids.¹⁰⁻¹⁴ In addition, psychophysiologic processes, including endorphin release, autogenic conditioning and distraction, may be activated by patterned environmental resonance.¹⁵⁻¹⁹ Thus, the literature supports the notion that music may facilitate movement through various permutations of order and disorder (health and disease) manifested via changes in consciousness and perception of pain.

Gaston¹¹ describes sedative music as characterized by a regular rhythm, predictable dynamics, harmonic consonance, and recognizable vocal and instrumental timbre. As such, sedative music may be conceptualized as patterned environmental resonance, amenable to the pattern recognition process described by Newman.³ Music, therefore, may provide the "light" that enables the person with rheumatoid arthritis to see the "possibilities for movement" beyond the personal restrictions in physical movement.³ Music may also provide a means through which nurses might rhythmically connect with people in an authentic way, thereby illuminating the pattern of pain and assisting in the discovery of new rules for movement (ie, action potentials) beyond physical movement. In turn, the discovery

of new action potentials facilitates movement to higher levels of consciousness, ie, evolving patterns of person-environment interaction, transformations.

BACKGROUND

The literature is replete with studies of pain, the pain experience, and nursing interventions designed to relieve pain.^{15,20-31} The theme that emerges from these studies reflects a conceptualization of pain as an overwhelmingly negative human experience. Chronic pain in particular is characterized as failure by both health care providers and by "victims."

The effects of patterned environmental sound (ie, music) on physiologic and emotional responses to various human experiences have been investigated in several studies. Updike³² explored the physiologic and psychologic effects of music therapy as a holistic nursing intervention. In critically ill intensive care unit (ICU) patients, Updike reported significant reductions in systolic blood pressure, mean arterial pressure, and the double product index after listening to taped music selections. In addition, patients' moods shifted significantly in the direction of a more desirable state of well-being, with significant reductions in anxiety and depression, and a diminished pain experience. Frank³³ and Cook³⁴ reported reductions in nausea and vomiting following music therapy among cancer patients undergoing chemotherapy. These authors suggest that music therapy may be an effective potentiator with antiemetic agents. Studies by Smith and Morris,³⁵ Peretti and Zweifel,³⁶ and Moss³⁷ report conflicting results regarding the effects of various types of music on anxiety. However, Peretti and Zweifel suggest that the subjects' prefer-

ences regarding type of music used rather than arbitrary labeling by the investigator as to type (sedative or stimulative) is a significant factor. In addition, Davis-Rollans and Cunningham³⁸ reported a significant decrease in heart rate and an improvement in mood state among cardiac patients in response to classical music.

Thus, the literature supports the notion that music as patterned environmental resonance influences the interconnectedness of the entire living system, subsuming cognitive and affective awareness, physiochemical maintenance, growth processes, and the immune system; ie, the consciousness of the human being, the ability of a person to interact with the environment.³

PURPOSE

The purpose of this exploratory study, therefore, was to investigate the use of music as a unitary-transformative means of altering the perception of chronic pain among women with rheumatoid arthritis within the context of Newman's model of health as expanding consciousness. It was hypothesized that the pain perception threshold would increase with the use of music as a unitary-transformative nursing intervention.

METHODS

Subjects

The sample for this repeated measures investigation consisted of 30 female volunteers who had been diagnosed with rheumatoid arthritis for a minimum of 6 months. Subjects were solicited from the practices of private physicians in a medium-sized city in the western United States, were able to read and speak English, and were capable of giving informed consent.

Instruments

The McGill Pain Questionnaire³⁹ (MPQ) was used to measure subjects' perceived pain thresholds. The MPQ provides information regarding the human pain experience through the use of descriptions of the present pain pattern and the present pain index. The MPQ asks subjects "What does your pain feel like now?" and consists of 78 words, each assigned a numerical value from one to five, that are sensory, affective, or evaluative in nature. The MPQ was designed to provide quantitative measures of the human pain experience. It generates several pain rating indices based on two types of numerical values that may be assigned to each word descriptor, the number of words chosen to describe the present pain experience, and the present pain intensity based on a 1 to 5 scale. Specifically, the Pain Rating Index, based on subjects' mean scale values consisting of the total words chosen in a given category (sensory, affective, evaluative) or in all categories, is designated as the Pain Rating Intensity scale (PRI[s]). The Pain Rating Index, based on the rank value of the words chosen, is designated as the Pain Rating Intensity-Rank (PRI[R]). The Number of Words Chosen (NWC) represents the sum of all words selected by the subjects as descriptive of their pain experience. The final measure generated is the Present Pain Intensity (PPI), which is based on a 1 to 5 intensity scale. The PPI is recorded as a number from one to five in which each number is associated with the following words: 1 = mild, 2 = discomforting, 3 = distressing, 4 = horrible, 5 = excruciating. According to McGuire,²⁰ extensive research and a multitude of pain measurement instruments support the MPQ as both a reliable and valid indicator of clinical pain.

For the purpose of this study, the PPI was used to determine that subjects were experiencing some degree of pain. The PRI(R) and the NWC were utilized for analysis since these scores presented a more synthesized or unitary view of the overall pain experience.

Procedure

Following human subjects' approval, names of potential volunteers who met the preestablished criteria for inclusion in the study were solicited from collaborating physicians. Following referral from physicians, prospective subjects were contacted by telephone to request their participation in the research study. During the telephone interview, the potential subject was asked to identify temporal pain patterns (Can you tell me when you usually experience pain?) so that an appointment could be scheduled during a peak pain period. If the subject agreed to participate in the study, an interview date and time were scheduled. All interviews took place in the subjects' homes at their convenience. Each potential subject was asked to identify her favorite type of music and whether she had a cassette tape that could be used during the intervention. If each subject had a tape with her favorite music, it was used during the intervention. If she did not, a cassette tape of the type of music preferred by the subject was provided by the researcher for use during the intervention.

Informed consent was obtained at the beginning of the scheduled interview, and subjects completed both demographic information and the MPQ, including the PPI. Subjects were then directed to begin playing the music using a small portable cassette

player, to set the volume to a preferred level, and to assume as comfortable a position as possible. Subjects listened to the music for an uninterrupted period of 20 minutes, at which point they were directed to complete the MPQ (What does your pain feel like now?) again. Following completion of the second MPQ, the music was terminated. Subjects completed the MPQ again in 2 hours.

Analysis of the data

Demographic characteristics of the sample are presented in Table 1. Unless otherwise noted, $n=30$. Information describing the extent to which the interview occurred during peak pain periods is presented in Table 1 (choice of single word to describe pain right now, at its worst, at its least). Descriptive statistics are presented in Table 2.

Data were analyzed using repeated measures analysis of variance for each variable. While the underlying particulate assumptions of quantitative methods may appear incongruent with the underlying unitary assumptions of the theoretical model in this study, repeated measures analysis of variance (ANOVA), with its focus on comparing differences within subjects as opposed to differences between subjects, was viewed as useful in answering the question posed in this exploratory investigation. Paired t -tests were selected as the method of choice for post hoc analysis of the differences between pairs of means at the various treatment levels for each variable. With a repeated measures design, the means are highly correlated and the variance among means is homogeneous. Thus, the paired t -test approach, considered to be more powerful under such circumstances, was utilized in fa-

Table 1. Demographic characteristics (n=30)

Category	Frequency	Category	Frequency
<i>Age (years)</i>		<i>Occasional need to stop all</i>	
31-40	2	work due to pain	
41-50	2	Yes	23
51-60	12	No	7
61-81	14	<i>Frequency of need to stop all</i>	
<i>Years of pain</i>		work due to pain	
1-5	4	Daily	14
6-10	7	Weekly	11
11-15	6	Monthly	5
16-35	13	<i>Pain description</i>	
<i>Ethnic background</i>		Choice of word group to	
White	27	describe pain	
Hispanic	1	Continuous, steady, constant	16
Native American	2	Rhythmic, periodic,	
<i>Marital status</i>		intermittent	13
Not married	2	Brief, momentary, transient	1
Married	21	<i>Choice of single word to describe</i>	
Divorced/separated	2	Pain right now	
Widowed	5	Mild	9
<i>Number of children</i>		Discomforting	11
None	5	Distressing	6
1-2	9	Horrible	3
3-5	15	Excruciating	1
6 or more	1	<i>Pain at its worst</i>	
<i>Pain and work/activity pattern</i>		Mild	0
Type of work		Discomforting	0
Housewife	21	Distressing	5
Office	4	Horrible	5
Service	2	Excruciating	20
Professional	3	<i>Pain at its least</i>	
Ability to work outside of home		Mild	21
Able	9	Discomforting	8
Unable	21	Distressing	1
		Horrible	0
		Excruciating	0

vor of the Tukey or Scheffe, since the latter approaches are more appropriately used with independent means. Hotelling's T^2 may have been an appropriate method had there been two or more variables in the re-

peated measures design. Since each variable in this study was examined individually, this method was also considered to be not appropriate. Given the high level of significance obtained for each variable in this study, the

Table 2. Descriptive statistics (n=30)

	Mean	SE*
<i>PRI(R)*</i>		
Premusic	24.87	2.23
During music	9.93	1.52
Postmusic	16.67	2.44
<i>NWC*</i>		
Premusic	11.27	.77
During music	5.93	.84
Postmusic	8.23	.96

*PRI(R)=Pain Rating Intensity-Rank; SE=standard error of mean; NWC=Number of Words Chosen.

possibility of Type I error associated with the use of multiple *t*-tests is minimized.

Repeated measures ANOVA regarding the PRI(R) yielded an *F* of 32.67, which was significant at the <0.001 level. Paired *t*-tests indicated significant differences between the PRI(R) at premusic and during music, between the PRI(R) at premusic and postmusic, and between the PRI(R) during music and postmusic. Specific results are presented in Table 3.

Table 3. Pain Rating Intensity-Rank [PRI(R)]

Level	Paired <i>t</i> -tests	
	<i>t</i>	<i>P</i>
Premusic During music	9.09	0.000
Premusic Postmusic	4.08	0.000
During music Postmusic	3.47	<0.01

Repeated measures ANOVA: *F* = 32.67, *P* < 0.001.

Repeated measures ANOVA regarding the NWC yielded an *F* of 18.23, which was significant at the <0.001 level. Paired *t*-tests indicated significant differences between the NWC at premusic and during music, between the NWC at premusic and postmusic, and between the NWC during music and postmusic. Specific results are presented in Table 4.

DISCUSSION

Results of the study indicate that the pain perception threshold increased while subjects listened to music for a period of time following the intervention. In this study, it appears that patterned environmental resonance may have enabled subjects to move beyond their pain, at least for the duration of the intervention experience. These results are congruent with those of McDonald⁴⁰ who examined the relationship between visible light waves and the experience of pain among women, ages 40 to 60 years, with rheumatoid arthritis. McDonald reported

Table 4. Number of Words Chosen (NWC)

Level	Paired <i>t</i> -tests	
	<i>t</i>	<i>P</i>
Premusic During music	8.50	0.000
Premusic Postmusic	4.06	0.000
During music Postmusic	2.99	<0.01

Repeated measures ANOVA: *F* = 18.23, *P* < 0.001.

that subjects exposed to shorter, higher frequency waves (blue light) were more likely to experience a reduction in pain than women exposed to either longer, lower frequency waves (red light) or a control condition of ambient light. In addition, McDonald's results indicated that the longer the exposure to blue light, the progressively greater the reduction in pain.

The interventions used in the present study and in McDonald's study both reflect the notion of energy as wavelength and the influence of the frequency of that wavelength on the human experience of pain. Subjects in both studies were women, primarily between 40 and 60 years of age, who were experiencing pain patterns associated with rheumatoid arthritis. Capra⁴¹ postulates that wavelength and its frequency define a particle's state of motion. Ference⁴² extends Capra's postulate to the human energy field and suggests that frequency of environmental energy waves (ie, visible light waves and sound waves) may transform the pattern of that human field. The interventions used in both studies may be construed as unitary-transformative in nature, reflecting the notion of patterned environmental resonance and its ability to transform the pattern of the person. It appears that patterned environmental resonance may increase the motion within the current dissipative structure, in this instance of pain, thereby precipitating a transformation of the pattern toward one of comfort and the emergence of diverse knowledge and experiences (ie, action potentials) not previously accessible. Ference⁴² theorizes that human field motion is the essential dimension of transformation, proposing relationships among humor, imagery, sound frequency, breathing, and field touch. Congruent with the theoretical un-

derpinnings of this study, Ference suggests that change occurs as human field motion increases, thereby transforming the pattern of the person and the mutual process between the person and the environment, with movement from a pattern of pain toward a pattern of comfort.

As such, the results of this exploratory study generate preliminary support for the use of music as a pain management or healing strategy for women with rheumatoid arthritis and for the theoretical constructs proposed by Newman.³ However, further study is necessary to more fully explicate Newman's theory of health as expanding consciousness and the model of consciousness as a dissipative structure. Specification and utilization of unitary measurements for unitary, pandimensional, transformative phenomena are critical. Inclusion of the Human Field Motion Tool⁴³ might have strengthened the study by providing a unitary measure of the underlying motion of the human energy field and any changes in that motion. In addition, one 20-minute period of listening to music, while associated with reduction in the experience of pain, is likely not sufficient to engender a transformation. Future studies might consider a longitudinal approach so that both pain pattern change and human field motion change might be explicated. Additional measures of the human pain experience that may be integrative or unitary in nature, such as visual analogue scales or auditory analogue approaches such as auditory sensory matching, should also be considered for further investigation into strategies with the potential to facilitate moving beyond one's present shape, form, or way of being, ie, to transform, to heal, "to soothe a savage breast, to soften rocks, or bend a knotted oak."^{1(p240)}

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