Psychological Effects of Music with Lyrics: A Methodological Study

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Brenda Layne Osuna

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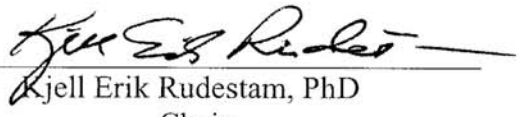

Kjell Erik Rudestam, PhD
Chair

Committee:

Karen E. Dill, PhD, Faculty Reader
Donald E. Polkinghorne, PhD, Faculty Research Specialist
David A. Jobes, PhD, External Examiner

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Abstract

The objective of this research was to improve methodology for studying the psychological effects of music with lyrics. Problems identified include past researchers' difficulty defining themes in lyrics and teasing out the effect of lyrics from the effect of music. The literature review serves as a primer for researchers who may not be versed in the multiple disciplines involved in the study of popular song. A method was devised for measuring lyric themes on a continuous scale by analyzing a sample of songs from the *Billboard* Hot 100 ($N = 300$; from the years 1990-2010) using Linguistic Inquiry Word Count (LIWC) and subjecting the results to principal components analysis. A 6-factor solution describing lyric themes resulted (Positive Feelings and Romantic Relationships; Inner Thoughts/Reflections and Desires; Anger and Impulsivity; Negative Emotions/Melancholy; Daily Concerns; Death, Isolation, and Religion). Factor scores were derived for each song in the sample. A sample of songs scoring high, low, and at the mean on each factor ($N = 90$) was analyzed using Latent Semantic Analysis (LSA). LSA detected differences in high and low scores as expected, but did not provide a very good overall measure of concurrent validity, most likely due to the limitations of LSA. Factor coefficients were used as multipliers on LIWC results for a small sample of songs ($N = 6$) to demonstrate and test the song theme scoring method. The method displays validity. The result is a procedure for describing lyric themes with the advantage of providing an

objective and continuous scale that has more specificity and flexibility than previous methods using categorical descriptions. It is suggested that further researchers use this method in experimental studies of popular song. Instructions for using the method are provided in the text. Best practices for experimental studies of popular song are outlined. A method of controlling for the effects of music when studying lyrics is described. Finally, suggestions for the further validation and use of the factor scoring method for lyrics are given.

Keywords: music, lyrics, psychology, methodology, song, popular music

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a spreadsheet detailing options, costs, and time factors. Tommy didn't even look at it--he just said, "Go." I cautioned him of the stress graduate school would likely cause--he said "Go." That was it. Tommy's can-do attitude pervades everything he does in life, and learning to take on this attitude myself has been key to the success of this dissertation. Together, Tommy and I have shared all the pain, joy, frustration, exhilaration, and everything else that has gone along with the completion of my doctoral degree. Tommy never faltered in his support for me at any point along the journey – though I have not always been such an easy travel companion. During the course of my doctoral program, Tommy has completed several important projects of his own, including two solo CDs and a collaboration CD with me. Together we have run three businesses during this time as well! So, Tommy, this achievement belongs to us together. My gratitude for your love and support is beyond words.

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Chapter One

Introduction

This dissertation is a methodological study with the goal of improving methodology in experimental investigations of the psychological effects of music with lyrics (songs).

"The major focus of the methodological dissertation is one or more of the issues involved in data collection, observation, measurement, statistics, or research design" (University of South Carolina, n.d., p. 37). Although all of these issues are touched upon, this study focuses on issues of research design – especially on the issue of operational definition and measurement of the independent variable *lyrics*.

The concrete goal of this dissertation is to answer the methodological research questions that emerged in the course of the literature review. Specifically, I focused on development and description of an improved experimental method for future researchers. The study also resulted in documentation of the many components of song, and explication of the numerous areas of music psychology that correspond to each of these components; with this information, researchers without a musical background may be better able to design studies with improved internal validity. In addition, a method for operationally defining and measuring thematic content in lyrics was developed and tested.

The literature review revealed a clear need for this study. Despite advances in the psychology of music and the ubiquitous presence of popular music in our culture, we still do not know with any degree of certainty if there are significant effects of music lyrics.

The psychological effects of music lyrics are rarely studied despite public, government, educational, and healthcare concerns. The difficulty of designing sound methodology for researching the effects of music lyrics has led some researchers to limit study materials to instrumental music, even when the musical genre is more generally presented with music and lyrics (e.g., Chavez, 2008). If any psychological effects of music lyrics exist, it is vital to discover them--they may have important educational, developmental, and public health implications.

There is ample theoretical basis for this study. Bandura's (1977, 1986) social cognitive theory postulates that verbal persuasion, modeling, and vicarious experience are all types of learning that shape an individual's thoughts and actions. Music lyrics provide for these types of social learning. Bandura's theory is the basis of research indicating that music and lyrics are indeed effective means of conveying such messages and that they influence affect and cognition in powerful ways (e.g., Anderson, Carnagey, & Eubanks, 2003). Theoretical models for understanding these effects will be described in detail at the close of the literature review.

One of the key factors in determining the validity of any experiment is ruling out alternative explanations. This is not possible to do if the researcher designing an experiment is unaware of how to break down the complex structure of a given variable in order to control for irrelevant stimuli; therefore, one of the goals of this study is to provide a road map to guide future researchers with diverse backgrounds in designing valid studies of music with lyrics. Most of the researchers who have conducted these studies have been psychologists with varied levels of musical sophistication. Given this,

and considering the many variables involved in song (even when presented in the most basic format), it is easy to understand the difficulty that researchers have had in designing quantitative research for the purpose of understanding the psychological effects of music lyrics.

To find out if lyrics exert effects independent of the effects of music, studies with improved internal validity must be designed. The literature review shows that the quantitative studies that do exist are fraught with confounds. Designs that do not adequately control for the music that the lyrics are set to have confounded many experiments. In many cases, existing popular songs are compared to one another, so that every experimental condition has not only a different lyric but also different music. Participants in studies of music lyrics are frequently college students familiar with the music used in experiments and are likely to have preexisting associations with and attitudes toward the songs. In addition, content differences in lyrics are frequently vaguely defined without scientific basis. The literature review discusses methods that researchers have tried to solve these problems.

Thyer (2001) enumerates three functions of a literature review: (a) "it constitutes a reservoir of knowledge for planning and understanding research," (b) "as a tool for study development…it affords a tool for conceptualization and operationalization," and (c) "it provides an atlas of potential error, facilitating the identification of potential problems in the research process" (p. 402). To be effective, a methodological study must have all three of these principles as goals of the literature review. Therefore, in addition to the critical review of the literature related to the psychological effects of music with

lyrics, areas related to the multiple variables inherent to the study of song are included in the literature review.

An introduction to musical terminology, an overview of history and literature in the psychology of music, and a section on linguistics and language precede the critical review of the literature on music with lyrics. These sections are followed by a review of other miscellaneous variables involved in human response to song; and finally, a section on relevant theoretical issues. These sections of the literature review serve as the basic "reservoir of knowledge" (Thyer, 2001, p. 402) that the study draws upon and are necessary as background information for anyone desiring to understand the many variables to be considered when designing a psychological study of music lyrics.

Following the literature review, the statement of the problem and research questions are given. Also, for the convenience of readers who may be unfamiliar with musical and linguistic terms, definitions are given in a glossary. Chapter 2 concludes with assumptions, limitations, and delimitations of the study. Chapter 3 describes the study method. Chapter 4 details the results of the study. Chapter 5 provides a summary, discussion, and suggestions for further research.

Chapter Two

Review of the Literature

Overview: The psychology of music. The psychology of music and lyrics is a subtopic within the psychology of music. Historically, the psychology of music is more specifically "the psychology of Western instrumental music"; therefore, unless specifically noted, the studies cited in this portion of the literature review generally refer to studies of instrumental (usually classical Western) music. The first part of this section defines musical terms. Next, a historical perspective on the literature is given, followed by a review of the literature in the psychology of music broken down by subtopic.

The Oxford Dictionary of Music defines a song as a "Short vocal composition, [with] accompaniment or solo"(Kennedy & Kennedy, 2006, "Song," para. 1). So, in its simplest form a song can consist of just two elements: a melody and lyrics. However, if we are to understand them completely, these two elements must be broken down and analyzed in detail.

Melody (or Tune) is "A succession of notes, varying in pitch, which have an organized and recognizable shape" (Kennedy & Kennedy, 2006, "Melody," para. 1). To understand this definition of melody we also must know that *note* is either the symbol representing a musical sound or the musical sound itself, and *pitch* refers to "The location of a sound in the tonal scale, depending on the speed of vibrations from the source of the sound, fast ones producing a high pitch and slow ones a low"(Kennedy & Kennedy, 2006, "Pitch," para. 1).

Note also refers to the written symbol of a pitch, which includes the symbol of its rhythmic duration (Kennedy & Kennedy, 2006, "Note," para. 1). *Rhythm* "covers everything pertaining to the *time* aspect of [music] as distinct from the aspect of pitch, [including] the effects of beats, accents, measures, grouping of notes into beats, grouping of beats into measures, grouping of measures into phrases, etc." (Kennedy & Kennedy, 2006, "Rhythm," para. 1). So, melody includes elements of both pitch and rhythm (scientifically explained in the branch of physics called *acoustics).*

Lyrics are the words of a song. To study lyrics we must delve into the scientific study of language (*linguistics)*. Just as a medical doctor must understand both the form and function of the human body by studying anatomy and physiology, the scientific study of music lyrics requires the study of both the structure and function of language. The subtopics of linguistics that most concern us here are *syntax, semantics, pragmatics,* and *discourse analysis*. Also, because this dissertation focuses on the scientific study of the effects of music lyrics on psychological dependent variables it is important to consider the biological, psychological, and sociological underpinnings of language. A discussion of issues in linguistics and language relevant to this study is included in a later portion of the literature review.

When music and lyrics blend in song, we must endeavor to understand the lyrics in terms of the musical syntax in which they occur and the interaction of linguistic and musical meaning. *Prosody* (the rhythm, syllabic stress, and intonation of words) combines with the elements of music to create another level of communication – the

prosody of music and words combined conveys more meaning when bound together in song.

In reviewing the history of the psychology of music and the literature in its main subdisciplines, the absence of work related to vocal music is striking. This is especially amazing considering that the psychology of music is a vast subject comprised of numerous subtopics and integrating knowledge from the many areas of musical study as well as anthropology, psychology, physiology, neuroscience, education, aesthetics, physics, sociology, and computer science. The discipline is grounded in the foundational areas of psychological study: perception, cognition, emotion, social psychology, and developmental psychology; but also, in music theory, acoustics, and the study of musical performance and education. To study the psychological effects of music lyrics, it is vital for any researcher to first attend to the literature in the psychology of music. An overview of the psychological issues surrounding instrumental music will place the study of music lyrics in proper and natural context. The difficulty of controlling for each of these variables will become apparent to the reader as each of the variables is enumerated. It is only by understanding what all the musical variables are that researchers can learn to prioritize precise control of music when studying music lyrics. The large body of available literature in instrumental music dwarfs the literature on vocal music; this fact further underlines the need for the development of sound methodology to study the effects of music lyrics.

As each subtopic within the psychology of music is considered, it is useful to keep in mind that there is the further division of each domain into the study of how each

relates to (a) listeners, (b) performers, (c) composers, and (d) educators/students. Cultural considerations are also crucial to every aspect of this field of study, for although music is universal to the human experience, a diversity of cultural expressions and understandings exists. Scholars study music holistically, and in terms of its component parts of melody, harmony, rhythm, and timbre. These can be broken down into the physical attributes of pitch, loudness, and tone color; and further, to the underlying physics involving the study of air pressure, waveforms (their frequency and amplitude), the harmonic structure of the overtone series, and the movement of sound in time. For the reader who is unfamiliar with these musical terms, definitions are provided at the end of Chapter 2.

History. This history highlights significant achievements and milestones in music psychology. As previously noted, the bulk of scholarship in music psychology addresses Western instrumental music in Europe and North America; therefore, so does this history. However, in the mid-20th century and continuing into the 21st (as an outgrowth of the alliance between ethnomusicology and music psychology) a fledgling movement to understand and integrate more diversity into the field has begun. The historical lack of cultural diversity in research, however, will be evident in this review.

The focus of study in antiquity was on music's place in developing morality and overall scholarship. There is plentiful evidence of discussion about the effects of music, even vocal music, on the human psyche and on morality, its usefulness in education as a means of increasing overall knowledge and cultural awareness, and the possibility of music having both a positive and negative influence on human behavior at least since

classical times. In *Protagoras,* Plato (380 BCE) writes of musical training as an essential part of education and social training.

> the teachers of the lyre take similar care [as that taken by the teachers of letters] that their young disciple is temperate and gets into no mischief; and when they have taught him the use of the lyre, they introduce him to the poems of other excellent poets, who are the lyric poets; and these they set to music, and make their harmonies and rhythms quite familiar to the children's souls, in order that they may learn to be more gentle, and harmonious, and rhythmical, and so more fitted for speech and action; for the life of man in every part has need of harmony and rhythm. (325-326a)

Plato's pupil, Aristotle, reflects on music at length in *Politics* (Aristotle, 350 BCE), and argues for the necessity of musical education; not only for the sake of acquainting youth with a source of pleasure, relaxation, and intellectual enjoyment, but also as a means of building character. Addressing music and emotion Aristotle says,

> Rhythm and melody supply imitations of anger and gentleness, and also of courage and temperance, and of all the qualities contrary to these, and of the other qualities of character, which hardly fall short of the actual affections, as we know from our own experience, for in listening to such strains our souls undergo a change. (Book 8, Part V)

Aristotle goes on to comment on the unique power of music to form character and to stimulate emotion.

> On the other hand, even in mere melodies there is an imitation of character, for the musical modes differ essentially from one another, and those who hear them are differently affected by each. Some of them make men sad and grave, like the so-called Mixolydian, others enfeeble the mind, like the relaxed modes, another, again, produces a moderate and settled temper, which appears to be the peculiar effect of the Dorian; the Phrygian inspires enthusiasm…The same principles apply to rhythms; some have a character of rest, others of motion, and of these latter again, some have a more vulgar, others a nobler movement. Enough has been said to show that music has a power of forming the character, and should therefore be introduced into the education of the young. The study is suited to the stage of youth, for young persons will not, if they can help, endure anything which is not sweetened by pleasure, and music has a natural sweetness. There seems to be in us a sort of affinity to musical modes and rhythms, which makes

> some philosophers say that the soul is a tuning, others, that it possesses tuning. (Book 8, Part V)

Many centuries later, Galileo's contemporary, mathematician and music theorist Marin Mersenne (b. 1588 – d. 1648), made strides in the physical science of sound. Among his achievements, he is the first scientist to determine the absolute frequency (i.e., the precise acoustic measurement) of a sound. Galileo (Galilei, 1638) also contributed to psychoacoustics (the study of subjective human perception of sound) using his knowledge of physics to explain why certain intervals (distances between notes) such as the octave are universally pleasing to the ear, but other intervals sound tense or disagreeable.

The focus on the physical properties of sound that began with Mersenne and Galileo in the 17th century continued as a growing number of scientists expanded knowledge of the physical nature of sound and musical perception in the 18th and 19th centuries. Mathematician and physicist Joseph Sauveur (b. 1653 – d. 1716) advanced the science of acoustics by researching the relationship between frequencies and pitch, and investigating harmonics, timbre, and musical instruments. Ernst Chladni (b. 1756 – d. 1827), a physicist and musician, investigated the resonant qualities of plates and discovered the speed of sound as it travels through various gases. Another physicist, Felix Savart (b. 1791 – d. 1841), improved understanding of the resonant qualities of physical objects (of great importance in terms of improving musical instrument construction).

A significant shift toward gaining a physiological understanding of music perception occurred with the contribution of Hermann von Helmholtz (b. 1821 – d. 1894), a German physician and physicist. Helmholtz's work advanced physiological

psychology in several areas, the psychology of music being one of many. *On the Sensations of Tone as a Physiological Basis for the Theory of Music* (von Helmholtz, 1875) is a major contribution that moved music psychology forward by leaps; not only because it marked the beginning of the study of the physiological psychology of music (combined with acoustical physics), but also because it heralded a shift toward inquiry into the scientific basis of music theory (indeed, it is the concentration on the search for empirical evidence that separates the music psychologist from the music theorist). Questions of musical perception and the relationship between perception and music theory continue to be central issues of music psychology today. Helmholtz is first to propose *place theory,* an important theory of pitch perception (discussed in a later section of this literature review).

Helmholtz's contemporaries in the 19th and early 20th centuries, Stumpf, Riemann, and Kurth, also advanced important theories of audition. A philosopher and pioneer in experimental psychology, Stumpf (1890) proposed *tonal fusion theory* to explain the perception of consonance and dissonance as a function of the likelihood of two tones fusing into the perception of one tone. According to Stumpf, it is more likely for this to happen in the case of certain intervals (e.g., a unison or an octave vs. a minor third). Stumpf subsequently found evidence contradicting tonal fusion theory to be compelling, but tonal fusion theory was influential nonetheless, perhaps because it generated so much scholarly argument – especially between Stumpf and psychologist Wilhelm Wundt. Stumpf and Wundt famously argued primarily about the "proper function for relating 2 frequencies to their perceived musical distance" (Gjerdingen,

2001, p. 961), but underlying this argument a more basic disagreement lurked, with the "top-down" viewpoint (which seeks understanding through analysis – as in Gestalt) being championed by Stumpf and the "bottom-up" (which seeks understanding through synthesis) by Wundt. The theories of musicologist Riemann in 1914 (Wason, Marvin, & Riemann, 1992) and, later, music theorist Kurth (1931) followed in Stumpf's tradition. Riemann adopted a viewpoint closely allied with Gestalt psychology (a movement founded by students of Stumpf) as a way of conceptualizing music perception. The physical sciences are the basis for Kurth's theories, but he also uses more mystical terms to describe music perception and is as likely to speak of music's "kinetic energy" as its "psychic energy." At the time, these ideas, like Stumpf's, were at odds with the fundamental research values of Wundt and his contemporaries.

In the first half of the 20th century, an expansion of the scope of music psychology began. Carl Seashore (b. 1866 – d. 1949) led a movement toward understanding music psychology from the educational perspective and Robert Francés (1958) took a more integrative approach to the psychology of music by examining social, biological, cultural, and educational factors as applied to music perception.

In the second half of the 20th century, especially the period from about 1980 on, a "cognitive revolution" in music psychology took place. During this explosion of productivity in the field, methodology for experimental study of the human musical experience is refined. The field grows and becomes more diversified as social, developmental, neurocognitive, and other psychologists join computer scientists, musicologists, linguists, and others in efforts to form theoretical and practical

explanations for psychological phenomena related to music. The pages to follow highlight these developments under the headings of their respective subtopics.

As the 21st century moves forward, the study of music cognition and perception is still very much in the forefront of music psychology. "Cognitive science is the interdisciplinary study of mind and intelligence, embracing philosophy, psychology, artificial intelligence, neuroscience, linguistics, and anthropology" (Thagard, 2007, para. 1). In the case of the cognitive science of music, musicology, ethnomusicology, acoustics, computer science, and music theory are also included as parts of the discipline. The study of cognition involves asking questions about how knowledge interacts with perception to create experience and behavior; therefore, an understanding of learning, memory, and perception is required for the study of music cognition. This understanding should be fundamental to psychological studies of music and lyrics as well.

As in all aspects of psychology, neuroscience, especially the use of functional magnetic resonance imaging (fMRI) technology, has become of primary importance in the psychology of music. Brain imaging is beginning to reveal the neural correlates of music perception and behavior.

The popularity of the International Conference on Music Perception and Cognition (ICMPC) illustrates the growth of worldwide interest in the psychology of music.

> Just under 100 papers were presented at ICMPC1 (1989). At ICMPC6 (2000) the number of papers listed in the programme was more than 300…there has been growth in the number of sub-disciplines and research areas represented at ICMPC. In addition to perception and cognition, which remain central to every conference, we have seen a flourishing of work on development, social and cultural aspects, biology and evolution, emotion and affective aspects, educational implications,

> and systematic theory and model building…there has been growth in the number of countries sending delegates to ICMPC. Particularly encouraging recent growth has come from the former states of the Soviet Bloc, and from South America…there has been a growth in the number of students attending ICMPC and presenting their work. Indeed, one of the most healthy aspects of ICMPC is the preponderance of delegates under the age of 35. (Lavy, 2001, para. 10)

Music cognition. Some (e.g., Gjerdingen, 2001) maintain that the term "music cognition" now supersedes the older term "psychology of music." Whatever label we give it, the blending of scholars and disciplines in the psychology of music are illustrative of the nature of music itself: Its ineffable characteristics are difficult to scientifically quantify and analyze. Music psychologists are a diverse group of scholars; many scholars in the field such as Krumhansl, Deutsch, Sloboda, Peretz, Zatorre, and Levitin are cognitive psychologists. Other scholars are involved in areas such as the developmental and social psychology of music (e.g., North and Hargreaves), yet these developmental and social psychologists are also frequently labeled cognitive music psychologists. The fact that the study of consciousness and the study of the psychology of music are both considered part of cognitive psychology is interesting because these two areas of psychological inquiry are quite possibly the most intangible--even mystical--areas of psychology. The challenges inherent in the process of becoming acquainted with the vast literature in the psychology of music continue to test those who must integrate this diverse well of knowledge in order to consider the enumerable variables involved in designing experimental research.

The nature of musical thought and how it transforms into musical action is an important facet of the study of music cognition. Gardner (1993) describes the two ways that researchers typically study what he calls "musical intelligence": either from the

"bottom up" (understanding music cognition and perception as the sum of its constituent parts of pitch, timbre, rhythm, etc.) or "top down" (taking a longer lens or more holistic view of music perception and cognition). According to Gardner's review of the empirical evidence, musical intelligence qualifies as being separate from other types of intelligence (such as linguistic intelligence). An "intelligence" is defined by Gardner as having the following qualities: (a) potential isolation by brain damage; (b) the existence of disabled individuals, prodigies, and other exceptional individuals; (c) an identifiable core operation or set of operations; (d) a distinct developmental history, along with a definable set of expert "end-state" performances; (e) an evolutionary history and evolutionary plausibility; (f) support from experimental psychological tasks; (g) support from psychometric findings; and (h) susceptibility to encoding in a symbol system.

Instrumental music and memory. Because of the length of time that music takes to unfold, we use both working and short-term memory to process musical information. Working memory operates to process music in the right auditory cortex. Frontal cortical areas may be recruited when the load on working memory is especially high (Gaab & Schlaug, 2003; Patel, Gibson, Ratner, Besson, & Holcomb, 1998; Zatorre, Evans, & Meyer, 1994). Long-term memory is also at play in terms of our subjective judgments of liking because in general, we tend to like what we have heard repetitively (Ali, 2004; Peretz, Gaudreau, & Bonnel, 1998).

Music perception. A topic of considerable concern in music psychology is that of perception. Studies of music perception (and the related field of psychoacoustics) address questions related to the simple perception of and complex relationships between pitch,

timbre, loudness, rhythm, consonance, and dissonance. Researchers use both computer-generated stimuli and naturally occurring sounds to study music perception. In order to understand the full variety of stimuli involved in the perception of song it is necessary to discuss music perception at length. This section addresses general auditory and musical perception. A subsequent section presents corresponding literature on language.

The elegant design of the ear and the process of audition. The function of the ear is to convert sound waves into neural impulses that stimulate auditory nerve cells in the brain. Another way to describe this is to say that the ear converts mechanical changes in air pressure to electrical impulses that the brain can interpret. Figure 1 (Brockmann, 2009) illustrates the anatomy of the ear. The outer ear collects ambient sound waves and transports them as vibrations (acoustically speaking, sound is the movement of energy through something--such as air or water) through the auditory canal to the eardrum (tympanic membrane) which vibrates in response. Vibrations from the eardrum are transported to the cochlea (or inner ear) by way of three bones: the malleus, incus, and stapes (together called the ossicles) that amplify the vibrations. Figure 2 (Ropshkow, 2004) illustrates the anatomy of the cochlea.

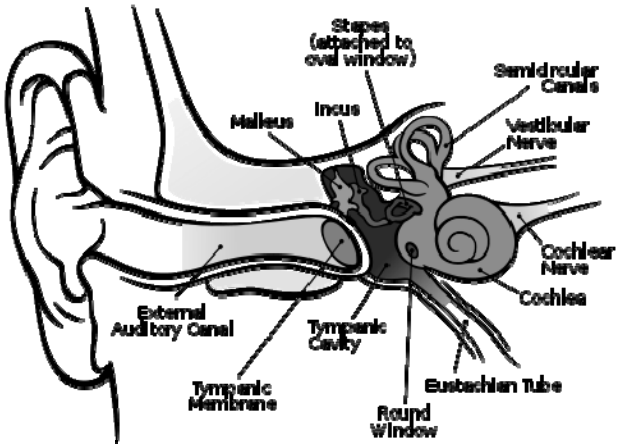


Figure 1. A diagram of the human ear. Reprinted from "Perception Space – The Final Frontier", by C.L. Brockmann, 2009, *A PLos Biology, 3(4), p. e137.* Source: Wikimedia Commons. Retrieved from http://commons.wikimedia.org/wiki/File:Anatomy_of_the_Human_Ear.svg# Reprinted with permission.

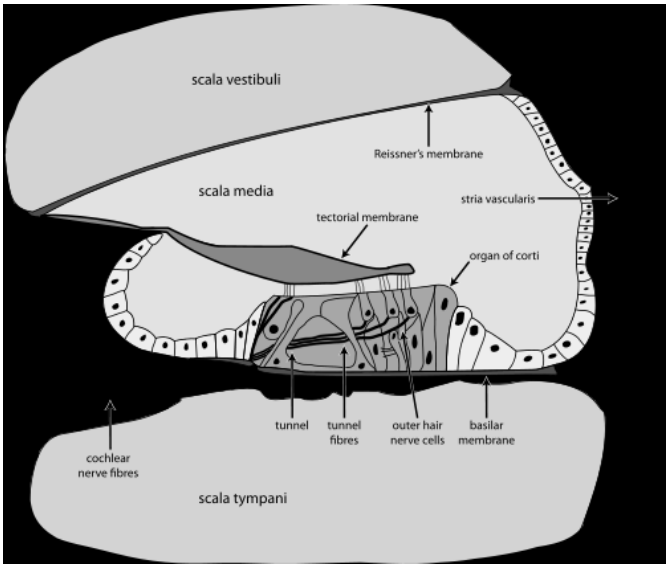


Figure 2. Cross-section of the cochlea. Reprinted from Wikimedia Commons. Cochlea cross-section by O. Ropshkow, 2004. Retrieved from http://commons.wikimedia.org/wiki/File:Cochlea-crosssection.png. Reprinted with permission.

Fluid that moves in response to the amplified vibrations passed on by the ossicles fills the cochlea. Inside the cochlea is the organ of corti. The movement of fluid inside the cochlea stimulates hair cells that reside on the basilar membrane located in the organ of corti. The basilar membrane is sensitive to different frequency vibrations because of its shape (it changes along its length from narrow to wide) and stimulates certain hair cells (these are also specialized to respond best to certain frequencies) according to the frequency of the sound that originally entered the ear. The vibrating hair cells make contact with the tectorial membrane and the movement of the hair cells transforms the energy into neural impulses that stimulate the auditory nerve. The conversion of the signal at the hair cells to neural impulses is called *neural transduction.* The impulses move along the auditory nerve stimulating neurons in the brain, thereby producing what we perceive as sound.

The properties of the cochlear basilar membrane and its relation to critical bandwidth are the subject of great interest in psychoacoustics and music perception. For any given frequency (subjectively experienced as pitch), the critical bandwidth is the smallest band of frequencies around it that will stimulate the same part of the basilar membrane in the ear allowing us to separate simultaneously sounding tones. Interestingly, the critical bandwidth is approximately the same size (about 1.2mm on the basilar membrane or about 1/3 musical octave) for all pitches on the auditory spectrum, regardless of their intensity. It is also interesting that this occurs despite intensity because the just noticeable difference (JND) between single tones depends not only on frequency and intensity (loudness or amplitude); but also, on duration, attack, and release qualities

of the tone. There are 30 divisions of JND within a critical bandwidth region (Greenwood, 1961).

The frequency specialization of the cochlear basilar membrane and hair cells create *tonotropic maps* (anatomically organized structures specialized for auditory frequency). In addition to the cochlea, tonotropic maps are located in the brain's auditory cortex, superior olivary nuclei, and in the midbrain. Tonotropic maps allow us to predict specifically what anatomical structures respond to particular auditory pitch stimuli.

Pitch perception. Several major theories explain pitch perception. Research supports each theory; however, with limitations in the case of each theory. Scholars believe that an integration of all the theories will eventually explain all the phenomena involved in pitch perception.

1. Place Theory (von Bekesy, 1963; von Helmholtz, 1875). This theory posits that pitch perception can be explained by the location of excitation of the basilar membrane alone. Bekesy, who won the 1961 Nobel prize for his work on the cochlea and its function in human hearing, based his theory on the earlier work of von Helmholtz (1875). The strength of place theory is that it can explain our perception of pitch at all frequencies within the human range of hearing. von Helmholtz and Bekesy's theories are incomplete because they assume the necessity of hearing the fundamental of a complex tone for accurate pitch perception (this is not necessary, as first described by Schouten, 1938). Most musical pitches are not pure tones; but rather, complex tones comprised of a fundamental frequency and harmonics (also called *partial*s) that sound at expected multiples of the fundamental frequency.

2. Timing Theory, also known as *Temporal Theory* (Schouten, 1940). Place theory alone does not explain our ability to perceive fine changes in pitch and to perceive missing fundamentals when only harmonics are present. Schouten proposes that a process called *phase locking* is involved in pitch perception. This theory posits that neural firings occur in timed response to specific parts of sound waves--the beats between unresolved harmonics. Harmonics move from resolved to unresolved as they increase in distance from the fundamental; although the differential distance is not precisely agreed upon, a general definition of a resolved harmonic is that "a trained listener must be able to 'hear out' the harmonic as a pure tone with a distinct pitch … [in a] comparison between a pure tone and the harmonic in a complex tone" (Plack, 2005, p. 22).

Timing theory has its drawbacks as well; it seems to work better at explaining perception of frequencies below about 4 kHz than above.

3. Duplex Theory (Licklider, 1951). Licklider proposes that neither the location of impulses along the basilar membrane, nor the phenomena of phase locking are enough to explain pitch perception. Instead, he proposes the theory that temporal information *combined* with place information is responsible for our ability to distinguish fine differences in pitch. In other words, the analysis of pitch perception by the nervous system involves both frequency and time analysis. Licklider's theory could also be considered a type of pattern theory (described below) because he theorizes that the resolution of resolved partials can explain the ability to perceive missing fundamentals. Licklider's theory analyzes frequencies according to interval relationships - producing an

"estimate" of the fundamental (that is why the theory is also called the "autocorrelation model" of pitch perception).

4. Pattern Theories (e.g., Goldstein, 1973; B. C. J. Moore, 2003; G. A. Moore & Moore, 2003; Terhardt, Stoll, & Seewann, 1982a, 1982b) propose that pitch is perceived by analysis of the pattern of resolved harmonics produced by a sound; that is, fundamental pitches are perceived as a function of analysis of the overall harmonic pattern. In pattern recognition theories the ear analyzes sounds to determine which fundamental pitch will best fit a particular combination of sonic components.

Some people have "perfect pitch" (the ability to name a sounded pitch with precision). Studies show (e.g., Russo, Windell, & Cuddy, 2003) that there is a critical period for acquisition of perfect pitch (5- to 6-years-old) when children can learn quite easily to identify a "special note" with practice. Despite this, Brown, Sachs, Cammuso, and Folstein (2002) cite instances of individuals who have developed perfect pitch without early training, so early training may not be necessary for the development of perfect pitch. Some (e.g., Baharloo, Johnston, Service, Gitschier, & Freimer, 1998 cited in Brown et al., 2002) consider genetics more important in the development of perfect pitch than early musical training. However, Levitin and Zatorre (2003) propose that the picture is more complicated. They believe that increased neuroplasticity at the time of early musical training, *combined* with genetic factors, may in large part be responsible for the phenomenon; however, they also note that "the right input at the right time" is necessary too. This input need not necessarily be formal musical training; in fact, Levitin and Zatorre speculate that such training could actually be detrimental to the development

of perfect pitch (due to the emphasis on *relative* pitch in musical training). As described by Levitin and Zatorre the development of perfect pitch is more akin to learning to match words with colors, although with pitch there are finer gradations to learn than with color-naming so it is a much more challenging task. Another finding by Matsunaga and Abe (2005) is that musicians with perfect pitch do not have superior key perception abilities when compared with nonmusicians without perfect pitch. If having perfect pitch does not help with contextual judgments, perhaps this unique ability provides very limited benefits.

Rhythmic perception. According to Krumhansl (2000), experiments that study rhythm usually look at the temporal space between notes that do not vary in pitch. These are called inter onset intervals (IOIs). Other elements of rhythm that receive scientific scrutiny are rhythmic groupings, meter, and ratios of rhythmic sequences.

> Two important generalizations emerge from basic research on the psychology of rhythm. First, although humans quite accurately estimate time and detect small differences in duration, the most impressive abilities are found in the perception and production of rhythms. Thus, patterns of durations, rather than absolute durations, are psychologically primary. Second, rhythm perception is strongly linked to rhythm production. Essentially all of the results coming from experiments on perception have parallels in experiments on production. This suggests a strong motor component to the psychological representation of rhythm. A number of more specific findings should also be recalled. Substantial evidence suggests that rhythms are based around a periodicity in the range from approximately 300 ms to 900 ms. Perceptual grouping of events is determined by multiple factors, including pauses and changes in duration, pitch, or intensity. Groups of groups can be formed, but total pattern duration appears to be limited to approximately 5 s. Finally, complex rhythmic patterns tend to consist of durations that are near either a 1:1 ratio (isochrony) or a 1:2 ratio. (Krumhansl, 2000, p. 161)

Lastly, rhythm perception appears to be relatively subjective. Listeners may perceptually impose less complex rhythms on more complex ones (Fitch & Rosenfeld, 2007).

Perception of sound intensity. In music, *loudness* (measured in *decibels)* refers to the perception of sound intensity. *Dynamics* refer to changes over time in the loudness of music. Dynamics can be very subtle and have a great deal to do with the emotional contour of a piece. Interestingly, we are capable of hearing a dynamic range of up to 120 dB despite the fact that the cochlear hair cells only have a dynamic range of 50dB (Levitin, 2006). This is possible because of our ability to *compress* auditory information so that large changes in loudness only create 1/4th of that change in the response of the cochlear hair cells. Loudness, like pitch, is a subjective experience created by the mind in response to physical vibrations moving through something (usually air).

Perception of timbre. Many definitions of *timbre* exist, but one useful way to think of timbre is that it is the tone "color" of a sound. Timbre characterizes our perception of different instruments and tonal qualities. Acoustically speaking, timbre is largely a function of the strength of the different harmonics of a fundamental tone; therefore, there is a close link between timbre and pitch perception. Timbre is also a function of the sound envelope, which describes the sound's movement in time (attack, decay, sustain, and release) and therefore is somewhat related to temporal aspects of perception.

Daunting issues of methodology complicate the study of timbre. For example, whether to treat timbre as a continuous or categorical variable is an issue when testing

perception of changes in instrumentation. Categorical descriptions are appropriate when using instrument names to describe timbre; however, when scientific measurements (such as sound envelope and harmonic frequency data) are collected, timbre becomes a continuous variable.

Saldanha and Corso (1964) identified factors that improve musicians' timbre recognition by creating tapes of various instruments playing three different frequencies (pitches) in random order and testing musicians on instrument identification. They found that (a) some instruments were easier to identify than others, (b) some pitches made it easier to identify timbre, and (c) vibrato made it easier to identify timbre. They also found that practice improves timbre recognition.

Handel and Erickson (2001) established a rule of thumb of one octave for timbre invariance (the ability to judge whether two notes separated by an interval were played/sung by the same instrument/voice). Steele and Williams (2006) replicated Handel and Erickson's study finding the bandwidth does seem to be one octave for nonmusicians, but not for musicians; therefore, there is apparently no human constant for timbre invariance.

Krumhansl and Iverson (1992) found that timbre interacts with pitch. Changing pitch breaks down the perception of constant timbre; conversely, whether timbre is constant or changes, relative pitch perception is unaltered.

Expectancy. The concept of expectancy is of great importance in every aspect of music composition and theory, so it is of no surprise that it is also important in the study of music perception. In composition, the concepts of musical tension and resolution are

primary considerations. Tension is built and musical interest is maintained by several means including holding back on delivering what the listener expects in the way of resolution (melodically, harmonically, rhythmically; and in popular songwriting, in terms of rhyme and poetic meter as well), using repetition, manipulating dynamics, changing timbre or key, and so on. These elements molded in time create phrases, movements, song sections, cadences, and so on, which combine to create the overall structure of a piece. Music psychologists seek empirical evidence about expectancy to support the tenets of music theory and to answer questions about why expectations of certain music structures, such as keys, exist.

The implication-realization model (Narmour, 1990, 1999) is a complex theory in music cognition that seeks to explain musical style and expectancy in cognitive terms. The model provides explanations from both a top-down and bottom-up perspective. In this case, top-down refers to the overall musical gestalt created by the structure of a piece and the interrelation of its various parts. Bottom-up primitives are the perceptual details of pitch, rhythm, and so on, which are processed as separate types of auditory input. Schellenberg (1996) quantified and tested this theory. His results indicate that the model is overspecified, but with fewer variables the model could retain its cultural universality and solid ability to explain expectation in music.

Music perception = (melody + harmony + rhythm + timbre+ X) over time. The intervals that occur between notes create the perception of melody. A chord (more than one note sounding simultaneously) creates harmony. In the larger sense, harmony describes relationships between chords as well as the relationship between chords and

melodies. Povel and Jansen's (2002) listener study concludes that the perception that a melody is "good" is linked strongly to familiar harmonic structure and the presence of chord tones as opposed to non-chord-tones in the melody (which will probably come as no surprise to students of music theory, but here we have empirical evidence).

Music is obviously much more than just the sum of its constituent parts, and the complexity of combinations that the parts can occur in is virtually infinite. Regardless of whether we use a bottom-up or top-down approach, we must look at the qualities of music as a whole to gain an understanding of its mysteries. "The musical experience is a complex bundle of wholes-within-wholes. Further, they are the products of experiential dynamics emanating from and bearing the imprints of merged genetic and learned behaviors" (Thomson, 2004, p. 433). The question of which behaviors and experiences are the result of which type of underlying process, or in what proportional combinations, is of great concern to cognitive music psychologists.

Auditory scene analysis (Bregman, 1990) is a model of the process whereby humans are able to manage the perception of numerous types of sonic input occurring simultaneously. This model addresses the phenomenon (often called the "cocktail party effect") whereby it is possible to understand a conversation as being separate from background noise and music even as our auditory system perceives this sonic input simultaneously. According to auditory scene analysis, we are able to use temporal and frequency groupings along with other types of schema (learned patterns) to do this by organizing auditory stimuli into "streams" of information. Patterns of closely related sonic information seem to organize more easily into streams (it is easier to perceive the

rhythm in its corresponding melody than in a separate rhythm or that of another melody--this could be what makes some complex types of rhythmic composition difficult for the uninitiated to comprehend).

Thomson (2004) argues for a bottom-up conceptualization of how we put all the elements of musical perception together to form the experience of a whole. He discusses how, from the basic building blocks of auditory perception, we create mental "bunches" out of information--creating musical phrases, chords, and tonality centers or "pitch frames." To his credit, Thomson does not limit his discussion and analysis to Western classical music and makes connections and interesting observations about what is universal in the human musical experience.

Style. Much of the literature in music psychology classifies music using broad generic style categories (rock, rap, country, classical, etc.); however, musical style categories as they naturally occur are broken down into a variety of subgenres. For example, in heavy metal some of the many subgenres are thrash metal, metalcore, progressive metal, Christian metal, and death metal. Rap music, an element of hip-hop culture, also has numerous subgenres including gangsta rap, conscious rap, and battle rap.

Because styles of music have a variety of subgenres, and within subgenres there are differences from song to song in terms of key, timbre, melody construction (stepwise, leaps, etc.), rhythm, harmony, and song form--each of which have a continuum of their own effects--there is a problem in operationally defining style and/or genre in categorical terms. This is why I propose that the only way to control for music in a study examining the effects of *lyrics* is to use the exact same music with different lyrics. Although this

method might lack ecological validity, and may raise the question of whether a lyric can be understood out of context from its music (that is, if the method were applied to already existing lyrics), I propose that professional musicians and lyricists could work together to compose two or more versions of a lyric set to the same music that could be analyzed for differences in psychological content so that controlled comparisons can be made. Precedents for this type of composition do exist in the real world of popular music. For example, reggae musicians frequently use the same music and rap or sing different lyrics as the mood strikes them. Sampling music that has been previously recorded with lyrics and recording it with different lyrics is commonplace, especially in the hip-hop genre of popular music.

Simply comparing categorized styles of music is a method lacking in internal validity because of the effects of the many components of a given song in a given style even if closely matched to another song. To match songs exactly on every variable that can provoke a given response while controlling for order and other effects would be virtually impossible. For example, Sloboda (1991) found that tears are provoked by certain types of melodic constructions (sequence or appoggiatura) and that shivers are provoked by unexpected or new harmonic developments. Husain, Thompson, and Schellenberg (2002) found that changes in tempo affect arousal, and changes in key affect mood. A single given piece of music may evoke multiple emotions, and computer models that have tried to assign music to emotional categories using single-label classification or regression models have failed (Trohidis, Tsoumakas, Kalliris, & Vlahavas, 2008).

Perception of musical style is the apparent result of the brain's general proclivity to search for patterns (Storino, Dalmonte, & Baroni, 2007). In the case of music, patterns include those imbedded in melody, harmony, rhythm, the structure of form, and the broader pattern that all of these create together. Additionally,

> one can observe, particularly in the "global" and "critical" observations, the presence of a metaphorical language (light, fluidity, monotonous, artificial) that hints at judgments not suggested by objective observations, but by the involvement of personal tastes, expressive expectancies, and implicitly synaesthetic processes. (Storino et al., 2007, p. 431)

When it comes to style, perception is complicated. Social factors also affect judgments of style – so experimentally comparing styles is problematic because style bias can provide an alternative explanation for observed effects. Negative style bias has been found to exist for heavy metal (Brunner, 2006; Recours, 2009) and rap music (Fried, 1996, 1999). Further compounding the problem, there is some evidence that (at least in America) negative attitudes toward rap are linked to more generally racist attitudes (Reyna, Brandt, & Viki, 2009). Also, Zapatel and Garcia-Lopez (2004) found that ethnicity can explain some differences in listeners' judgment of different musical styles.

To summarize, it seems that *how* we experience and judge music is a product of both innate processes and accumulated knowledge.

The developmental psychology of music. The human musical experience begins in infancy and continues throughout lifespan development. Childhood musical developmental milestones include the ability to spontaneously create and sing one's own tunes at 18 months (Ostwald, 1973 cited in Peretz, Gagnon, Hebert, & Macoir, 2004); the ability to distinguish "happy" from "sad" music at about age 3; the ability to distinguish

other, more intense emotions implied in music (such as anger and fear) by age 5 to 6; the ability to discern emotion in music based on all the characteristics (tempo, mode, scale, etc.) of the music indigenous to a child's culture by age 6. Once they are developed, lifelong retention of these abilities is usual (Cunningham & Sterling, 1988; Twergot & van Grinsvin, 1988; Dolgin & Adelson, 1990; all cited in Juslin & Sloboda, 2001).

Trehub (2001 cited in Juslin & Sloboda, 2001) finds that infants can distinguish between caretaker speech and caretaker singing and that, as measured by attention time, infants prefer singing to speech. Trainor, Tsang, and Cheung (2002) found that 2- and 4-month-olds prefer consonant over dissonant intervals using a measurement of "looking time" in relation to sound source. This suggests an anatomic linkage between perception of consonance and dissonance (and preference for consonance).

Children ages 4 to12 are quite capable of singing a familiar song with varied emotion (to make the song sound happy or sad) using general devices such as tempo and facial expression (Adachi & Trehub, 1998), with no need for the use of specific musical technique.

The relationship between adolescent development and musical experience is of great interest to researchers as well. The American Psychological Association (APA) study on the sexualization of girls in the media found that sexualized images and messages, including those in music videos and lyrics, are harmful to girls' psychological development (American Psychological Association Public Information and Media Relations, 2007).

Frequently, the theoretical foundation for studies of adolescents and music is social learning theory. For example, Lloyd (2002) conceptualizes an interesting model:

> The adolescent identity, media, and sociocognitive schema (AIMSS) framework offers a theoretical understanding of adolescent consumption and cognitive processing of media entertainment. Review and integration of mass communication theory, developmental theory, and ecological theory serves as the conceptual foundation. The framework outlines linkages between media exposure and adolescent development, in particular adolescent identity formation and social competence. A key contribution of the model is consideration of the positive and negative aspects of adolescent cognition and behavioral functioning. (Lloyd, 2002, p. 73)

Studies of music and the developmental process of individuals over age 65 reveal the importance of music throughout our lives. A qualitative study conducted in Australia by Hays and Minichiello (2005) illustrates the power of music at this time of life, focusing on the meaning and importance of music in people's lives, revealing significant benefits for quality of life that are measurable in terms of mood, interpersonal connectedness, self-esteem, feelings of spirituality, and many other dimensions. Koga's (2005) 5-year study also finds many positive benefits for the same age group.

Throughout the lifespan, music accompanies the human experience in its many expressions: spirituality, ritual and ceremony, therapy, entertainment, persuasion and advertising, expression and elicitation of emotion, education, background ambience, and for the musician, it is nothing less than a life path.

The social psychology of music. The social psychology of music has close links to the allied fields of anthropology and ethnomusicology. Music is socially important across cultures in numerous ways: It plays a role in the establishment of group membership (on a cultural or subcultural level) and identity, it has an effect on attitude

formation (e.g., Calfin, et al., 1993 cited in Crozier, 1997), it can be a powerful force for social influence and persuasion, and it has an effect on consumer behavior (e.g., Eroglu, Machleit, & Chebat, 2005; Mehrabian & Russell, 1974). Crozier (1997) discusses the possibility that music may exert social influence through attention and mood. Priming, a process of the activation of neural networks, may also be involved. Music may evoke moods that share connections in memory with actions; thus, moods may influence behavior (Timmerman et al., 2008).

Music and emotion. Juslin and Sloboda (2001) note that, perhaps because of the difficulty of studying emotion in general and the heavy emphasis on cognitive science in the psychology of music, this area of inquiry has been slower to develop than other areas of music psychology. Subjective emotional word to music association studies are the basis of much early and continuing research into music and emotion (e.g., Zentner, 2007).

New research methodologies in studies of music and emotion focus increasingly on attempts to determine neural correlates of emotional response to music. Such studies are not as plentiful as those on music perception and cognition; however, those that exist are fascinating. For example, a series of studies involving a participant known as "IR" was conducted by Peretz, Gagnon, and Bouchard (1998). After suffering brain damage to the auditory cortex, IR somehow retained the ability to perceive emotion in music (and enjoy it) even though her music perception and memory functions were severely impaired. Her case presents an ideal opportunity to study musical emotion in isolation. The findings of these studies indicate that IR's limbic system may have functioned independent of cortical systems, providing evidence for the idea that musical emotions

may be innate and reflexive. The work of Peretz and others with normative subjects in this and other studies (e.g, Peretz & Gagnon, 1999) provides further evidence for separate neural pathways for perception of musical emotion and other aspects of auditory perception and memory.

Juslin, Liljeström, Västfjall, Silva, and Barradas (2008) found that personality and situational variables are important correlates of emotional response to music. This underscores the need for naturalistic studies of music and emotion such as those being carried out by the ongoing Appraisal of Music and Emotion Project (AMUSE) at Uppsala University in Sweden:

> The goal of this project is to construct a model that combines different psychological mechanisms in order to explain and predict listeners' reactions to music. The model is developed and tested by means of interplay between field studies that capture experiences of music as they spontaneously occur in everyday life and laboratory studies that test theoretical predictions experimentally. The project relies on modern methods (e.g., diary studies featuring ambulatory measurement of physiological responses, synthesized music performances) as well as multiple measures of emotion (e.g., self-report, facial expression, physiology, voice changes, behavioral measures) to capture the often elusive reactions to music. The project offers unique insights concerning the numerous factors in music, in listeners, and in situations that influence music listeners' emotional reactions to music. This new model may serve to guide future research in the field. The project also has important implications for applications such as music therapy. (Juslin, Lundqvist, Västfjäll, Laukka, & Liljeström, 2007, para. 1)

Neuroscience and the psychology of music. Although no complex brain process can be said to be entirely localized to one cortex or another, or to be completely independent of other neural processes, some general principles of organization for neural processing of music are emerging. Processing of frequency and temporal aspects of music (pitch and time) are probably discrete neural operations. The right auditory cortex is of prime importance in the processing of frequency information (Tramo, Shah, &

Braida, 2002). In contrast, as seen in Figure 3 (Levitin, 2006, p. 264), temporal aspects of music are processed in a less localized manner. Peretz and Zatorre (2005) state that the evidence supports the view that time is processed in the brain as two separate stimuli, *grouping* and *regularity*. Grouping is akin to harmonic or melodic rhythm. Regularity is akin to meter or beat. Lesion and neuroimaging studies have suggested the cerebellum and/or basal ganglia as possible central mechanisms controlling motor and perceptual timing; thus, perception of rhythm is strongly linked to motor ability (Janata & Grafton, 2003).

A neural network for analyzing melodies for scale information probably exists and a similar network may exist for analyzing harmony, though it is not yet known where either of these networks may be located (Peretz & Zatorre, 2005). Analyzing deviations from harmonic expectancy appears to involve inferior frontal areas on both sides of the brain (Tillmann, Janata, & Bharucha, 2003).

Musicians' brains are different from nonmusicians in numerous ways. Musicians have highly developed motor cortexes (Gaser & Schlaug, 2003; Krings et al., 2000), enlarged corpora callosa (Schlaug, 2003), and enhanced cortical representations of the "fingering" hand (Elbert, Pantev, Rockstroh, Wienbruch, & Taub, 1995). The earlier musicians begin study, the more pronounced these neural enhancements tend to be (Elbert et al., 1995).

> Music processing functions are distributed throughout the brain. The figures [3 and 4] show the brain's major computational centers for music. The first illustration is a view of the brain from the side. The front of the brain is to the left. The second illustration shows the inside of the brain from the same point of view as the first illustration. These figures are based on illustrations by Mark Tramo

published in *Science* in 2001, but are redrawn and include newer information. (Levitin, 2006, p. 263)

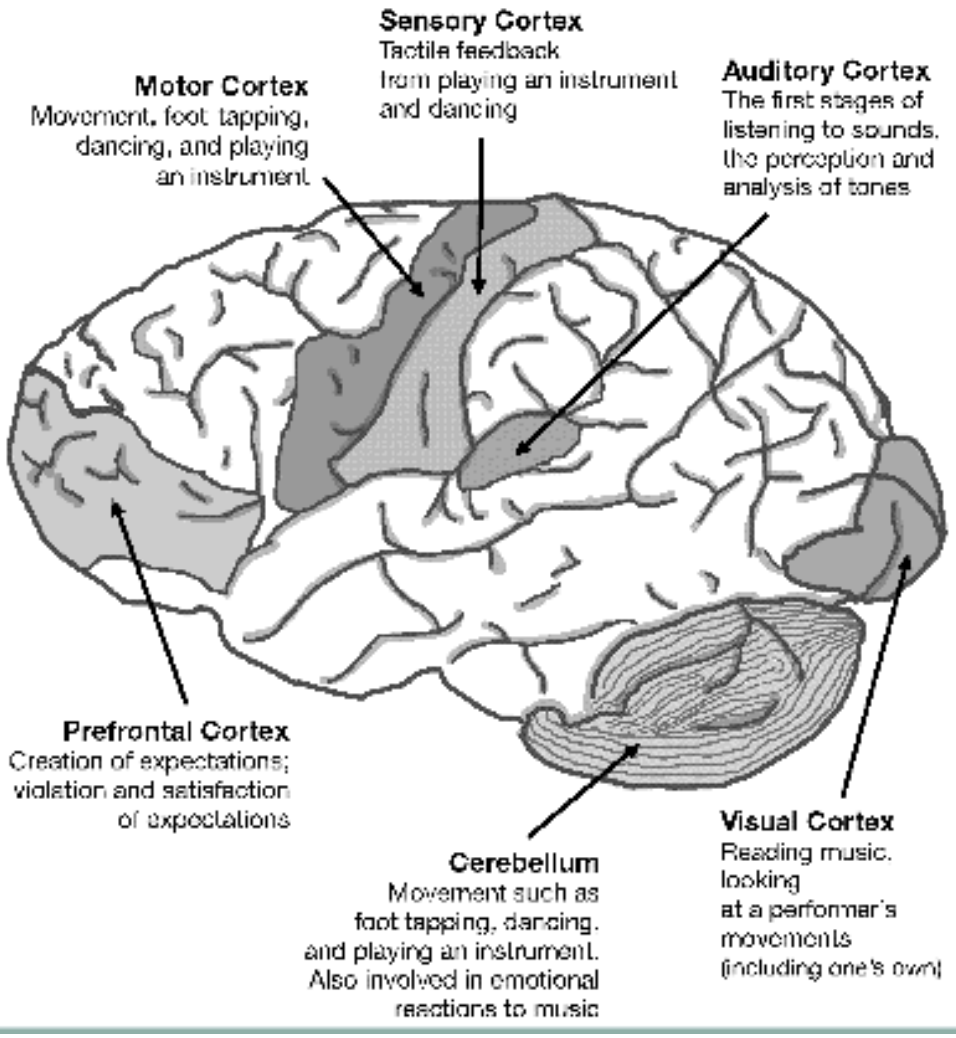


Figure 3. Lateral view of the brain. Adapted from *This is your brain on music: The science of a human obsession*, p. 264, by D. J. Levitin, 2006, New York: Dutton. Copyright 2006 by Penguin Publishing. Reprinted with Permission.

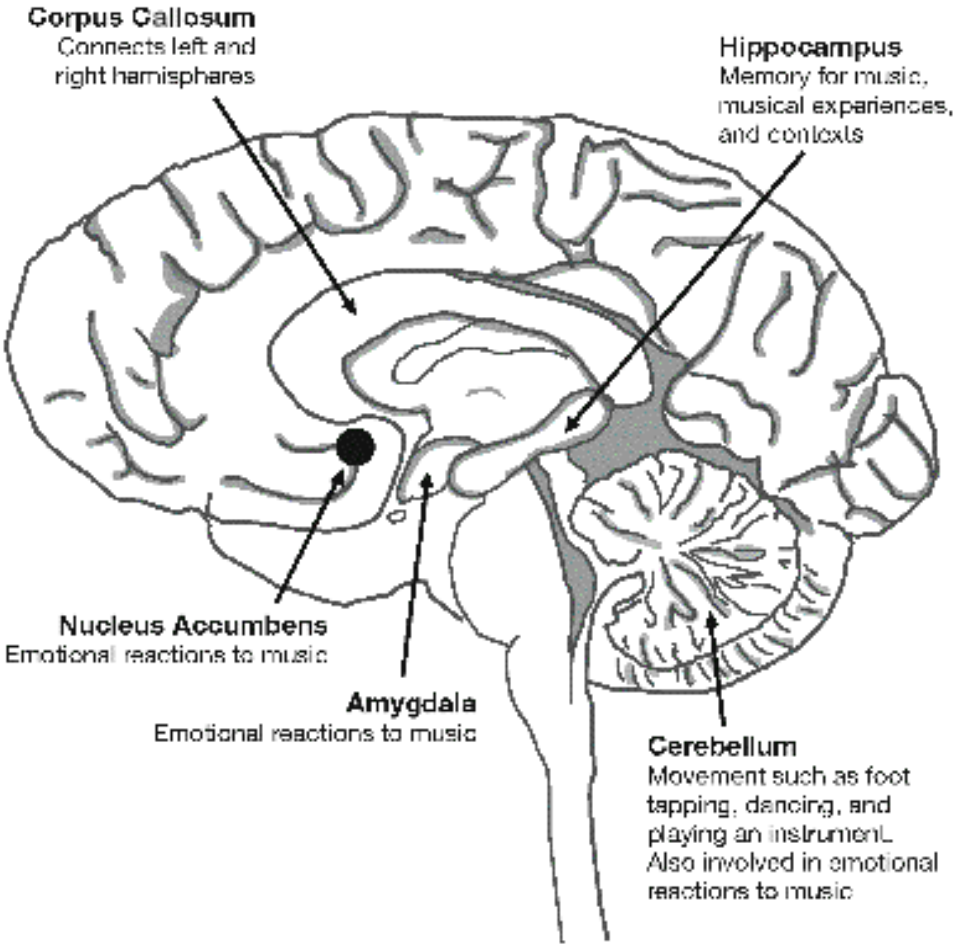


Figure 4. Cross-section of the brain. Adapted from *This is your brain on music: The science of a human obsession*, p. 265, by D. J. Levitin, 2006, New York: Dutton.

Current research in the neuroscience of music focuses on studies of individuals with brain lesions and, to a lesser but increasing extent, studies of normative individuals using fMRI technology (discussed at length in Peretz & Zatorre, 2003, 2005). Peretz, Gagnon et al. (2004) note that using fMRI studies to attempt to isolate complicated cognitive processes is always confounded by the fact that the brain is constantly multitasking; therefore, the preference of many researchers for studying individuals with particular types of brain damage is understandable because "they can serve as their own controls" (p.388). Even so, after reviewing the literature, Peretz, Gagnon et al. conclude that because all humans who do not have some disorder of amusia can sing and listen to music, researchers should more actively seek to study the normative population, not just individuals with cognitive deficits.

Neurocognitive processing of language and music.

"As cognitive and neural systems, music and language are closely related….Comparing music and language provides a powerful way to study the mechanisms that the mind uses to make sense out of sound" (Patel, 2008, p. 417).

Examining research that directly studies song (e.g., Besson, Faïta, Peretz, Bonnel, & Requin, 1998; Bonnel, Faita, Peretz, & Besson, 2001) may be more revealing and pertinent to the topic at hand, but it is important to note that most research examining the neurocognitive processing of music and language has studied instrumental music (as opposed to song). While acknowledging that the neural functions of music and language are complex and not easily separated from one another, Patel (2008) contends that by focusing on instrumental music in connection with spoken language "it forces us to

search for the hidden connections that unify obviously different phenomena" (Patel, 2008, p. 5).

For example, there is apparently some connection between the affective processing of music and language. In a review of 104 studies of vocal expression and 41 studies of music performance, Juslin and Laukka (2003) found that certain quantifiable qualities of tempo, pitch, loudness, and other acoustic cues were consistently perceived as anger, fear, happiness, sadness, or tenderness regardless of whether the expressions were of a musical or spoken variety.

Another connection between music and language processing is indicated by findings that Brodmann's area 47, which is associated with language, may be a temporal processing center for various types of nonlanguage information. Levitin and Menon (2005) examined neuroanatomical correlates of rhythmic perception using fMRI to compare neural response to classical music versus the same music "scrambled" rhythmically. The purpose of introducing the scrambled music was to minimize confounds by keeping pitch, loudness, and timbre constant while scrambling temporal components only. Results revealed that neural correlates of pitch, loudness, and timbre remain constant across conditions, but there are differences in Brodmann's area 47 of the inferior frontal cortex.

Another example of research suggesting close connections between music and language processing is Patel, Peretz, Tramo, and Labreque's 1998 study to test whether the event-related brain potential P600 is specific to language. In this study the researchers inserted syntactic language errors and altered the harmony of the music. Thus, the

manipulations for both music and language were syntax errors. In this case, there were not significant differences in the processing of the music and language errors, suggesting that the P600 is not language specific. The authors infer from this that music and language processing occurs in an integrated fashion and conclude this suggests that cognitive processing of music and language can be studied together; however, subsequent research suggests that this is not the case with music and *lyrics*.

Neurocognitive processing of vocal music (song).

Understanding whether neural processing of the words and music of a song occur in an integrated or an independent manner is an important aspect of designing appropriate methodology for the study of music and lyrics. Historically, the dominant viewpoint is that melodies and lyrics are integrated in memory (Crowder, Serafine, & Repp, 1990; Serafine, Davidson, Crowder, & Repp, 1986), though some studies have cast doubt upon that view (Racette & Peretz, 2007; B. L. Thiessen, 1990). Others have found evidence for a modified association between music and lyrics in memory. For instance, Samson and Zatorre (1991) found evidence for an additive dual-processing model involving both the right and left temporal lobes in memory for lyrics and tunes. The model describes the involvement of one process for music and lyrics and one for lyrics alone. In a study involving a patient with amusia, Hébert and Peretz (2001) found evidence for some independence of lyrics and tune in memory; they therefore suggest that rather than being integrated, music and lyrics are better described as *associated* in memory. This view is supported by both Ginsborg and Sloboda (2007) and Racette and Peretz (2007) who found that music does not aid in the memorization of lyrics (with the possible exception

of expert singers). Wallace (1994) showed that music assists in learning and recalling text. Infant learning of text is enhanced by tune and vice versa (E. D. Thiessen & Saffran, 2009). Peretz, Radeau, and Arguin (2004) showed that music and lyrics have a bidirectional priming effect upon one another.

Considering that aphasia and amusia (disorders of processing language and music, respectively) can occur in isolation to one another (Peretz, Gagnon et al., 2004), perhaps music and language have separate processing pathways after all. If they do, scientists might predict that individuals with a deficit in one area, but not the other, would be able to remember words (if the individual has amusia) or music (if the individual has aphasia) that go together in a song even if they could not recall the information from the other domain. Peretz, Gagnon et al. (2004) state that the literature does record such cases; therefore, they believe that there are at least two neural pathways for processing music and lyrics. If these separate pathways exist, an unanswered question is whether the linkage or separation of music and lyrics occurs at some point in the perceptual process or during memory encoding.

Two studies have established the independence of lyrics and their corresponding tunes in normative individuals (Besson et al., 1998; Bonnel et al., 2001). The studies evaluated event-related brain potentials (ERPs) in conditions that had either semantically congruous or incongruous words that were sung either in or out of key. Because semantic and musical violations trigger responses from very different areas of the brain, it was possible for the researchers to determine that violations of one and not the other, or violations of both triggered the areas in a way that led to the conclusion that lyrics and

tunes are independently processed. The authors note that syntax errors would be more similar to musical errors because language and music both have syntax (this is consistent with the findings of Patel, Peretz et al., 1998).

More support for the independence of lyrics and tunes was found by Yasui, Kaga, and Sakai (2009) who carried out a study of music and lyric processing using magnetoencephalography (MEG) to measure participants' brain activity while detecting unexpected errors in either lyric or tune. The study concluded that there is a distinct hemispheric dominance for the processing of each component of song.

In conclusion, it appears from the current evidence that neurocognitive processing of music and lyrics is separate in a semantic sense (Besson et al., 1998; Bonnel et al., 2001), but more integrated at a syntactic level (Patel, Peretz et al., 1998). Still, priming effects do create a bidirectional associative effect between words and music in memory (Peretz, Radeau, & Arguin, 2004).

The psychology of music and media effects research. Music is a form of media. *Media* can be defined as any form or vehicle of communication used by human beings and includes, but is not limited to, film, music, art, the internet, and multimedia combinations of these and other modes of communication (including those in existence today and those not yet invented). Music is an integral part of almost every other form of media. Film, television, video games, web sites, even many visual art installations incorporate music (frequently, music with lyrics) into the media experience; therefore, an understanding of the literature in the psychology of music is essential to the overall study of media psychology and, conversely, a background in the literature of media effects is

helpful to the researcher in music psychology. Using media-savvy theories of learning and development (e.g., Bandura, 2001; Lloyd, 2002) as a theoretical basis for studies of music and lyrics can be helpful aids to conceptualization of research into the cognitive, affective, developmental, social, and educational aspects of music psychology.

The evolutionary psychology perspective. Evolutionary theory may provide a good explanation for human musical behavior. Darwin (1871) wrote a great deal about the evolutionary roots of music, discussing the use of music as an advantage reinforced through natural selection and expressed not only by humans but also, by other primates, birds (in birdsong), and insects (e.g., in the song of the cicada, cricket, locust, and grasshopper).

> When we treat of sexual selection we shall see that primeval man, or rather some early progenitor of man, probably used his voice largely, as does one of the gibbon-apes at the present day, in producing true musical cadences, that is in singing; we may conclude from a widely-spread analogy that this power would have been especially exerted during the courtship of the sexes, serving to express various emotions, as love, jealousy, triumph, and serving as a challenge to their rivals. The imitation by articulate sounds of musical cries might have given rise to words expressive of various complex emotions. (Darwin, 1871, p. 56)

If Darwin is correct, the study of music with lyrics could be of more importance than some have imagined – perhaps shedding light on the early development of human language.

There is debate among psychology of music scholars about music's evolutionary basis ("Commentaries on Origins of Music," 2006). Some scholars believe that music is a purely social phenomenon; others contend music has an evolutionary biological function. The difference is largely defined by whether an individual considers the group or

individual adaptive value of music to be more important (Justus & Hutsler, 2005; J. McDermott & Hauser, 2005).

McDermott and Hauser (2005) review the empirical literature in diverse scholarly fields, finding some evidence for factors unique to music and to humans that support an evolutionary explanation of human musical behavior and cognition, but nothing conclusive. In addressing the controversy pitting the theory that human musical behavior has been determined by natural selection vs. the theory that it is an exaptation (a side benefit developed as an outcropping of other abilities that *were* developed through natural selection), Justus and Hutsler (2005) also look for evidence to determine whether human musical behavior is innate or culturally determined; and if so, whether it is actually *music* that is innate or if music is an outcropping of another domain (such as language). Like McDermott and Hauser, Justus and Hutsler find incomplete evidence to support the evolutionary viewpoint.

> Without sufficiently addressing the issue of innate constraint, one might erroneously credit a cultural phenomenon to natural selection. Without sufficiently addressing the issue of domain specificity, one might erroneously credit a selection pressure to one domain when it belongs to another. (Justus & Hutsler, 2005, p. 21)

Pinker (1997) likens music to "auditory cheesecake." In his view, music is like cheesecake because although it is pleasurable, we don't *need* it in a biological sense. However, perhaps we have biological needs not yet measured by science. Use and enjoyment of music is culturally universal and may serve a currently unknown purpose that is necessary for our well-being. Intuitively and experientially, the great majority of human beings seem to grasp the power of music to lift us up and connect us to something

greater than ourselves; to immerse us in that which is infinite and universal; to involve us in ecstasy, intensity, focus, and depth of expression; to connect us to one another, to nature, and to spirituality; to inspire feelings of deep peace, anguish, elation, and desire. We are only beginning to understand the factors involved in the psychology of optimum health, happiness, and resilience. As our scientific understanding of music psychology increases, the evidence may show that music is indeed quite necessary to the human condition and deserving of a more nutritious analogy than that of cheesecake.

Music therapy: the healing power of sound. Music therapy is frequently conducted as a process of creating or discussing lyrics as the focus of work. Therefore, improving methodology for discovering psychological effects of music lyrics will be of special benefit to research in this important field.

Music therapy has become increasingly popular and mounting empirical evidence supports its use. Even in the course of a single session, music therapy can significantly improve mood (Jones, 2005). Music therapy is effective in a wide variety of settings and with diverse populations. Just a few examples of those who benefit from music therapy include prison inmates, and patients with traumatic brain injuries, lung conditions, chronic pain, cancer, multiple sclerosis, and chemical dependence (Baker, Kennelly, & Tamplin, 2005; Elsila, 1998; Jones, 2005; Kenny & Faunce, 2004; le Roux, Bouic, & Bester, 2007; O'Callaghan, 1996; O'Callaghan & McDermott, 2004). Gunsberg (1991) shows the usefulness of music in helping social interactions among developmentally delayed children. Music therapy from a feminist perspective is useful in the treatment of survivors of domestic abuse (Curtis, 2000). Healthy subjects also show positive mood

changes and lowering of cortisol levels (associated with stress) in response to music therapy (McKinney, Antoni, Kumar, Tims, & McCabe, 1997).

Success in music therapy is frequently measured in terms of mood, but also in terms of coping, and pain perception (Kenny & Faunce, 2004), immune and endocrine system response (le Roux et al., 2007), and other measures of well-being.

Qualitative music psychology research. Qualitative studies abound in the psychology of music (Edwards, 2004; Langenberg, Aigen, & Frommer, 1996). Many of these explore the usefulness of music as key to understanding the inner world of patients. A psychoanalytic viewpoint informs many of these studies. A case in point is the research of Apramian (1991) who examined the experience of eight adolescents who listen to rock music. She identified important functions the music serves for the participants and how these relate to possible developmental and relational issues. The study shows how symbolism in music lyrics (and the listener's personal relationship with the symbolism) is rich in material to explore in psychotherapy.

Another example of qualitative research in music psychology is Diraimondo's (2002) study of eight music therapists and eight general practice psychotherapists working with adolescents. Diraimondo found that music therapists generally use music as a method of reaching specific behavioral goals (staying focused, learning social skills, etc.), but general psychotherapists use music (listening to or discussing it) as a way of increasing rapport and gaining knowledge about the client.

Music consumption. Music is a ubiquitous presence in our lives. According to the Middletown Media Studies II (Papper, Holmes, Popovich, & Bloxham, 2005), adults in

the U.S. listen to 65.1 minutes of music per day; however, this does not include the music that is embedded in the 80 minutes of radio, 240.9 minutes of television, 32.6 minutes of video, 135.8 minutes of computer use, 93.4 minutes of internet use, and 11.6 minutes of game use also consumed per day on average.

Klein et al. (1993) surveyed 2,760 14- to16-year-olds in 10 different U.S. southeastern cities and found they listened to music an average of 40 hours per week. Girls listen more per day on average than boys do (2.0 hours vs. 1.29 hours).

Roberts, Foehr, and Rideout (2005) found that in the U.S. 8- to18-year-olds listen to an average of 1.44 hours per day of audio media (radio, CDs, MP3s, and tapes combined). Foehr (2006) found that 7th to 12th graders in the U.S. listen to music a total of 9.57 hours per week. This number includes listening to music as a primary activity and listening while multitasking, but does not include music listening that occurs incidental to gaming, watching television, internet use, and other media usage. The lower number of music listening hours per day in these studies compared to the Klein et al. (1993) study may be due to the increasingly wide variety of media competing for the leisure time of youth.

However, in the U.K., those under age 25 listen to music over 6 hours per day on average. Those over 25 years of age listen about 5 hours per day. These figures may be higher than in the U.S. because they include both passive (background) and active (main activity) listening (British Music Rights & University of Hertfordshire, 2008).

Other varieties of musical experience include attendance at live concerts, musical theatre, dance performances, social dances, and parties; however, the National

Endowment for the Arts (2009) survey of participation in the arts indicates that attendance at performing arts events in the U.S. is in significant decline (the survey was taken in 2008 prior to the economic downturn later that year).

In addition to time spent listening to music as a primary or secondary activity, consumers of all ages are exposed to music at other times, such as when attending religious services, while shopping, at sporting events, and when waiting on hold on the telephone.

Linguistics. As stated in the introduction, the study of music lyrics involves the scientific study of language (*linguistics)*. Due to the complexity of linguistic issues, previous experimental researchers have not taken linguistics into account in study design (with exceptions, e.g., Thompson & Russo, 2004); however, researchers employing content analysis have made linguistics of primary concern (e.g., G. Cook & Mercer, 2000; Petrie, Pennebaker, & Sivertsen, 2008; Rierola Puigderajols, 2001). The following is a brief discussion of important linguistic elements to consider when designing experiments involving music lyrics.

General concepts. *Syntax* is "the study of grammatical relations between words and other units within the sentence" (Matthews & Oxford University Press, 2003, "Syntax," para. 1). *Grammar* is "Any systematic account of the structure of a language [and] the patterns that it describes" (Matthews & Oxford University Press, 2003, "Grammar," para. 1); however, it is debatable whether music lyrics have an indigenous grammar. Certainly lyricists regularly violate the rules of English grammar (for numerous

examples see Grosvenor, 2000-2010), though they frequently conform to the grammatical conventions of regional and cultural dialects.

Semantics are "the study of meaning" (Matthews & Oxford University Press, 2003, "Semantics," para. 1) and can refer to many levels of language such as the meaning of individual words, phrases, and sentences. Semantics are of prime concern in the categorization of lyric themes.

Pragmatics are "usually conceived as a branch of semantics concerned with the meanings that sentences have in particular contexts in which they are uttered" (Matthews & Oxford University Press, 2003, "Pragmatics," para. 1). The pragmatics of music lyrics are of great concern to the subject at hand. This is exemplified by the findings of Greenfield et al. (1987). The researchers found a lack of comprehension of the overall meaning of the song "Born in the U.S.A." (Springsteen, 1984). The strong chorus may overshadow the sarcasm in the lyric; therefore, if the chorus is taken out of context from the verses, the meaning of the song is lost to the listener.

Discourse is "any coherent succession of sentences, spoken or …written. Thus an entry in [a] dictionary is an example of discourse; likewise a novel; likewise a speech by a politician or a lecture to students; likewise an interview or any other series of speech events in which successive sentences or utterances hang together. Often equivalent to text" (Matthews, 1997, "Discourse," para. 1). Lyrics are a type of discourse and as such have been subjected to *discourse analysis* (G. Cook & Mercer, 2000; Foss, 2008). Discourse analysis is "the attempt by various linguists to extend the methods of analysis developed for the description of words and sentences to the study of larger structures in,

or involved in the production of, connected discourse" (Matthews & Oxford University Press, 2003, "Discourse analysis," para. 1). Connected groupings of lyrics such as those written during a specific time frame are well suited to methods of discourse analysis.

Prosody is "traditionally, the study of metres in verse. Usually, in linguistics, of rhythm and intonation in speech: e.g. the contour of an intonation, as falling, rising, etc., is a prosodic contour" (Matthews & Oxford University Press, 2003, "Prosody," para. 1). Both meanings of prosody in this definition are relevant to the study of music lyrics. First, *scansion* (a system for marking strong and weak syllables in poetry or lyrics) is an appropriate means for studying lyric prosody. Prosodic elements in speech convey meaning. For example, the rising of one's voice at the end of a sentence indicates a question. Similarly, musical elements provide additional prosodic elements to the words of a song. To give an example of how pitch adds to prosody, if the singer sings the word "high" while hitting a high note, the traditional meaning of the word is emphasized; however, if the same word is sung on a low note an element of sarcasm may be injected into the meaning of the word. A famous example of how rhythm adds to prosody in a song is "Stop! In the Name of Love" recorded by the Supremes (Dozier, Holland, & Edward Holland, 1965). The word "Stop!" is sung followed by an unexpected rest on a strong beat. This pattern reinforces the meaning of the word by stopping the music to emphasize the command "Stop!"

"Any study of language in or from the viewpoint of psychology" is called *psycholinguistics* (Matthews & Oxford University Press, 2003, "Psycholinguistics," para. 1). This includes the developmental psychology of language and the psychology of the

production and reception of language. The psychological study of music lyrics can be characterized as a part of this field.

> That the words people use are diagnostic of their mental, social, and even physical state is not a new concept. Freud (1901) provided several compelling examples in his discussion of parapraxes, or slips of the tongue. He pointed out that common errors in speech betray people's deeper motives or fears. Drawing heavily on psychoanalysis, Jacques Lacan (1968) extended these ideas by suggesting that the unconscious asserts itself through language. Indeed, language, in his view, is the bridge to reality. Philosopher Paul Ricoeur (1976) argued that the ways we describe events define the meanings of the events and that these meanings help us keep our grasp on reality. Similar assumptions are implicit in much of the work in sociolinguistics (e.g., Eckert 1999, Tannen 1994), narrative and discourse analyses (Schiffrin 1994), and communication research (Robinson & Giles 2001). (Pennebaker, Mehl, & Niederhoffer, 2003, p. 1)

Sociolinguistics is "any study of language in relation to society" (Matthews & Oxford University Press, 2003, "Sociolinguistics," para. 1). Many studies of music lyrics, particularly content analyses, have been carried out by sociologists (e.g., Horton, 1957). Sociological research has found a connection between musical taste and with lifestyle correlates and membership in social and economic groups (North & Hargreaves, 2007a, 2007b, 2007c). "Indeed, distinguished sociologists such as Adorno (1941) argued long ago that different musical forms and languages are a direct product of existing social divisions and structures" (North & Hargreaves, 2007c, p. 476).

Previous sections on audio perception and neurocognitive processing of music and language contain a discussion of the biological processes of receptive language and differences between singing and speaking. Although the process of expressive language involves more than has previously been covered, the aims of this study relate to the

effects of reception of music lyrics and the categorization of written or sung music lyrics, so further detail on the biology of language is excluded from this review.

The question of meaning. A great challenge in the study of music lyrics is determining their meaning. Linguists, philosophers, and other scholars do not agree on methods for the determination of meaning in language. Some of the many theories of linguistic and literary meaning are the various hermeneutic approaches, structuralism, postmodernism, aestheticism, postcolonialism, poststructuralism, and psychoanalytic theory.

Morton (2002) and Morton and Trehub (2007) found that children tend to find emotional meaning directly from words and lyrics, whereas adults tend to judge emotional content from the context in which words or lyrics occur (the prosody of word utterances and/or the music that accompanies lyrics).

In discussing emotion and meaning in lyrics, Thompson and Russo (2004) enumerate three viewpoints about the function of lyrics: (a) that they are subservient to, or absorbed by, their accompanying music (*assimilation*), (b) that they are separate entirely from the music they accompany (*independence*), and (c) that they are separate, but have some overlap of function with music (*interaction).* In three experiments, Thompson and Russo found that the type of music accompanying a lyric influences the meaning ascribed to lyrics; they also found that lyrics sung to familiar music are perceived as being more meaningful than spoken lyrics, and that repeated listening to unfamiliar music increased the meaningfulness ascribed to lyrics that accompany the

music. So, the level of meaningfulness that individuals ascribe to lyrics is not static; it is dependent upon the setting (the music) that they are presented with.

In a study of meaningfulness in music and lyrics, Wiehe (1996) captures the difficulty of coming up with a way to concretely define meaningfulness in popular song even as he describes the operational definition of meaningfulness for his study:

> meaningfulness, for the purposes of this study, is a multidimensional concept, composed of properties of depth…, clarity, intensity, and pleasingness. These dimensions are closer to being defined by prototypical, fuzzy concepts than they are to being defined by operationalized or formal (classical) constructs. That is, while most individuals appear to know what these concepts mean, inasmuch as they can give examples and perform tasks that clearly utilize the intended meaning, the concepts are very difficult, if not impossible, to define with exacting precision. (Wiehe, 1996, p. 42)

Although multiple interpretations of meaning are possible for many lyrics, some lyrics' multiple meanings are intended. This is evident in the use of double entendre to provide suggestive content or humor (e.g., "Big Ten Inch Record"; Weismantel, 1952), the use of multiple meanings for the purpose of sarcasm (e.g., "Born in the U.S.A."; Springsteen, 1984), and the use of euphemism to express content that might otherwise be censored if presented in more readily accessible language (e.g., "Milkshake"; Williams & Hugo, 2003).

Lewis (1983) contends that music is "an ordered system of meaning and symbols in terms of which social interaction takes place…in popular music there is a framework of beliefs, expressive symbols, and values in terms of which individuals define their world, express their feelings, and make their judgments"(Lewis, 1983, p. 136). Popular music then is a form of symbolic communication that conveys political, social, emotional, moral, and other values. Lewis concludes that the study of popular music

should be “the study of the **meaning** of music to those creating and consuming it” (p. 136). If this is so, perhaps one of the best ways to operationally define lyric content for experimental studies may be to study the meanings given to content by those who write and listen to the types of music under investigation.

Even sophisticated computer models that find meaning in text do not judge meaning in a static fashion:

> in LSA [latent semantic analysis], word meaning is generated by a statistical process operating over samples of data, it is no surprise that meaning is fluid, that one person's usage and referent for a word is slightly different from the next person's, that one's understanding of a word changes with time, that words drift in both usage and reference over time for the whole community. Indeed, LSA provides a potential technique for measuring the drift in an individual or group's understanding of words as a function of language exposure or interactive history. (Landauer & Dumais, 1997, p. 227)

Music with lyrics (song). *Popular music* (Western song of the 20th and 21st centuries, with the exception of song in the classical style, e.g., opera) has been studied by social scientists with varied levels of musical expertise and ability to express musical variables in precise language. For example, Thompson and Russo (2004) display musical sophistication when describing the song “Kodachrome” by Paul Simon (1973): “the music that accompanies these lyrics has a fast tempo (132 bpm), is in a major mode, has a syncopated rhythm, and is timbrally bright” (p. 55); this is in contrast to Gowensmith and Bloom’s (1997) characterization of the music used in their study as "highly angry in style" or "considered fun in style" (p. 35). The affective attributes assigned to the songs in the Gowensmith and Bloom study are not further explained. The lack of explanation for these attributions makes replication of the study difficult, if not impossible.

Composition and structure of music with lyrics. Popular music with lyrics is composed in one of three ways: (a) the lyrics are written first, and then set to music, (b) the music is written first and then lyrics are written to the music, or (c) the music and lyrics are written together. Many lyricists are also music composers (e.g., Paul Simon, Joni Mitchell, Paul McCartney). Some lyricists write the words and a collaborator writes the music (e.g., Oscar Hammerstein, Bernie Taupin, Robert Hunter).

Although there are no rules per se for writing popular songs, methods for analysis and composition have been devised (e.g., Garland, 1942; Pattison, 1991a, 1991b; Perricone, 2000). Perricone and Garland's methods for analyzing and composing popular music use principles of classical and jazz music theory and composition adapted to popular song forms. Pattison and Garland's lyric writing and analysis methods use *scansion,* a system for marking strong and weak syllables in poetry to address the prosody of lyrics in terms of syllabic stress, rhythmic and metrical patterns. The prosody of a lyric is analyzed for compatibility with music in terms of rhythm, melody, and harmony. Interactions between linguistic and musical meanings are analyzed/composed for various intended effects. For example, singing the word "long" on a held note is reinforcing of the linguistic meaning of the word, singing it quickly might imply sarcasm or humor. Expectation effects are also key to analysis because popular songs use predictable forms; therefore, satisfying or violating listener expectations can hold listener attention or focus the listener to a particular word or line. Line length, rhyme patterns, consonant and vowel sounds can all be used to create listener expectation and other effects.

Popular songs use a limited number of song forms. This applies to all genres of popular music (an exception would be progressive rock, which often employs classical or extended song forms).

Public concern about psychological effects of music lyrics. The question of whether music lyrics affect behavior has troubled parents, educators, healthcare professionals, legislators, and others for decades. Many worry that sexually explicit, violent, or drug-glorifying lyrics are an effective means of persuading listeners to act out undesirable behaviors. Involvement in certain music cultures (especially punk, heavy metal, and rap) is sometimes presumed to be an indicator of mental health problems; in fact, in 1991 Rosenbaum and Prinsky found that 83% of adolescent care facilities (N = 12) presented with a case involving a parent whose main concerns about their child were the type of music they listened to, their style of dress, and the posters they hung on their walls, recommended hospitalization for the child *even though the case presentation specifically indicated an absence of substance abuse and symptoms of mental health problems.*

On the basis of the belief that lyrics influence the behavior of listeners, several famous lawsuits have alleged that recording artists were responsible for the behavior of their fans. The rock band Slayer was sued by a murder victim's parents who alleged that Slayer and their record company were purveyors of an unsafe product (namely, music with violent lyrics) capable of influencing their daughter's killers to murder and rape her. The lawsuit was dismissed. In the ruling, the judge specifically stated that the band's lyrics did not meet the legal definition of harmful material (*Pahler v. Slayer*, 2001). A second lawsuit was filed by the Pahlers against Slayer, but this was also dismissed.

A lawsuit brought against the band Judas Priest alleged that the band's lyrics (namely, the supposed subliminal messages to "do it") were instrumental in persuading two young men to make and carry out a suicide pact (one of the victims survived the suicide attempt). The lawsuit was dismissed; however, the case is notable for the fact that the judge found that subliminal messages do not have First Amendment protection.

> The judge, Justice Jerry Carr Whitehead, ruled that the First Amendment's protection of freedom of speech and press does not extend as far as subliminal messages. Since the recipient of a subliminal message is unaware of it, the message can't contribute to dialogue, the pursuit of truth, the marketplace of ideas, or personal autonomy. There is no information exchange when it comes to subliminal messages, and no disagreement or argument is possible if recipients are unaware of the message's presence. Judge Whitehead also explained that people have a right to be free from unwanted speech. Since subliminal material cannot be avoided, it constitutes an invasion of privacy (Vance v. Judas Priest 1989b). Justice Whitehead ruled, however, in favor of Judas Priest. His ruling was based on the defense's insistence that the power of such a message to move a person to action has never been proven ... He stated his conclusions on the subliminal threat in this way: The scientific research presented does not establish that subliminal stimuli, even if perceived, may precipitate conduct of this magnitude...The strongest evidence presented at the trial showed no behavioral effects other than anxiety, distress or tension" (*Vance v. Judas Priest 1990*, 18 cited in Dane, Johnson, Pauli, Phillips, & Strausz, n.d.)

An interesting issue is raised by the findings in the Judas Priest case. Listeners claim to frequently have trouble comprehending the lyrics of songs, and are often unaware of what the lyrics to a song will be before they hear it, so it could be argued that many lyrics are "subliminal" in nature. In fact, subliminal lyrics can be created simply by turning down the volume of a sung or spoken section relative to other musical elements in a recording. It is not out of the realm of possibility that the legal precedent set in the Judas Priest case could be used to successfully argue a similar case in certain circumstances, especially if research finds that lyrics can influence behavior. Therefore, it

is of the utmost importance that research into the effects of music lyrics be both valid and reliable.

Lawsuits have been brought against recording artist Ozzy Osbourne over his song "Suicide Solution" (Osbourne & Rhoads, 1980). The lawsuits have claimed that Osbourne's song influenced individuals to commit suicide by means of both explicit and subliminal lyrics (*McCollum v. CBS Inc*., 1988; *Waller v. Osborne*, 1992). The court found in Osbourne's favor in these cases. It was also shown that the plaintiffs were mistaken about both the content and the meaning of the lyrics to "Suicide Solution" which, according to Osbourne, is an anti-alcohol abuse song.

Public concern about the lyrics of certain musical artists is frequently raised outside the courtroom, particularly in the media. For example, after the Columbine tragedy, there was much speculation about possible connections between the killers' behavior and the music they listened to (e.g., Marilyn Manson).

Although the cases mentioned above are relatively recent, concerns about potential deleterious effects of music lyrics are not new. Censorship of radio in the U.S. was first applied in the1950s when the songs "Wham, Bam, Thank You Ma-am" (recorded by Dean Martin; Penny, 1950) and "Four or Five Times" (recorded by Dottie O'Brien; Herman, 1944) were banned for being too sexually suggestive (Nuzum, 2003). Stack, Krysinska, and Lester (2007) discussed the case of the song "Gloomy Sunday" (Seress & Jávor, 1933), which has been reputed to prompt individuals to commit suicide (though there is no evidence of a direct link), especially during the 1930s. The song was banned in various countries until as recently as 2002.

Concern about music lyrics came to a head in 1985 when a group of Washington, DC women formed the Parents' Music Resource Center (PMRC). Through the efforts of the PMRC, the United States Senate Committee on Commerce, Science, and Transportation held a hearing on the "Contents of Music and the Lyrics of Records"(*Record labeling*, 1985).

> Parents Music Resource Center wanted a labeling system on records that would warn parents of the violent or sexually explicit lyrics in the music. Their argument was that it may be personal choice for an older listener to choose this type of music but a child or adolescent is more vulnerable to the graphic lyrics. Dr. Joyce Brothers testified the mixing of violence and sex in music lyrics leaves the youthful listener confused. Senator Gore stated that the youth are being exposed to violence through the music that they would otherwise not be exposed to. The parents groups, although not successful at their attempt to label the graphic music as pornography, which would have made it illegal for minors to buy it, were able to get a label system. The label is meant to warn parents when an album contains violent or sexually graphic lyrics (United States Senate Committee on Commerce, Science, and Transportation, 1985). (Cohen, 2004, pp. 10-11)

The opposing viewpoint to that of the PMRC was represented at the congressional hearings by numerous individuals, including recording artists Frank Zappa and John Denver, who testified that children's listening habits should be regulated by parents, and that music appreciation should be provided in schools to inform children about musical choices and diversity. As an alternative to a labeling system, Zappa proposed uniform printing of music lyrics so that consumers could make informed purchasing decisions (*Record labeling*, 1985).

Subsequent to the hearings, the PMRC, Parent-Teacher Association (PTA), and Recording Industry Association of America (RIAA) worked together to devise a voluntary labeling system. Later, the effectiveness of the labeling system was called into

question. In 1994, 1997, and 1998 more hearings regarding the content of music lyrics were held before the Senate commerce committee. The 1985 hearings were focused on rock music, specifically heavy metal, but the subsequent hearings were more focused on the content of rap lyrics. No legislation was under consideration at these hearings.

In 1996 the American Academy of Pediatrics (AAP, 1996) issued a statement on the impact of music that said in part, "the AAP strongly opposes censorship. At the same time the AAP is greatly concerned that negative behavioral messages are being recorded and repeatedly broadcast" (American Academy of Pediatrics Committe on Communications, 1996, p. 1219). The AAP recommended that (a) pediatricians encourage parental awareness and supervision in regard to their children's music listening and purchasing choices; (b) pediatricians join in local and national discourse about the effects of music lyrics; (c) the music industry implement voluntary, or if necessary, legally mandated, labeling of music lyrics that are violent, sexually explicit, or drug-oriented; (d) broadcasters and the music industry should exercise voluntary restraint and responsible decision making about music lyrics; (e) performers should be positive role models for youth; and (f) "*research should be developed concerning the impact music lyrics have on the behavior of adolescents and preadolescents* [emphasis added]"(AAP, 1996, p. 1220).

The American Psychological Association Task Force on the Sexualization of Girls (APA, 2007) found that girls are exposed to sexualized messages that have negative consequences on development. In addressing music lyrics, the task force found a notable lack of content analysis related to sexualized messages in the literature. Nevertheless,

they found many examples of sexualized content in popular songs. The task force also found evidence of sexualized content in the literature on music videos. Several positive alternatives to counteract the negative effects of sexualized media content were suggested by the task force: (a) educational alternatives (media literacy education, comprehensive sex education, extracurricular activities and sports to encourage competence as opposed to appearance); (b) family based interventions (coviewing, colistening, religious and spiritual practices, and parental activism); (c) empowerment options (alternative media use, activism to promote nonsexualized content, and empowerment groups).

Despite concerns about music lyrics, a Kaiser Family Foundation study found that

> Very few parents exercise controls on the kinds of music to which their children may listen – at least once the child has reached junior high school age. Only 16% of the 7th- to 12thgraders to whom this question was posed indicate their parents impose such rules. Age emerged as a major predictor, with 22% of 11- to 14-year-olds and 11% of 15- to 18-year-olds admitting to such controls; no other demographic characteristic was related to explicit rules about music. Twenty percent (20%) of 7th- to 12th-graders say they have listened to music they know their parents would disapprove of – four percentage points more than say their family has music-related rules. Finally, 14% indicate that their parents look at the parental warning labels on music. Parental use of music warning labels is negatively related to age and positively related to parent education. (Roberts et al., 2005, p. 17)

To those concerned about music lyrics, the two styles of popular music that receive the most focus are heavy metal and rap. Stereotypical viewpoints about these styles of music and the individuals who listen to them are prevalent. There is a common overgeneralization about lyrical content in these styles tending to focus on negative themes (such as violence, misogyny, Satanism, etc.); however, although some lyrical themes may dominate a particular subgenre, a wider range of themes exist. For example, within the heavy metal genre there is much light-hearted "party" music and Christian

heavy metal is a large subgenre; within rap there is "conscious" rap that encourages positive thinking and behavior.

Experimental and quasi-experimental studies of music lyrics. This section of the literature review will examine experimental and quasi-experimental studies. These are the designs that the proposed study seeks to improve. In the literature, authors often state that experimental studies' results have conflicted as to whether music lyrics do or do not exert influence on psychological variables. Although it is true that research findings conflict as to whether music or lyrics are more *important* in producing effects (e.g., Sousou, 1997; Stratton & Zalanowski, 1994), I have found that results are more consistent when studies are sorted by dependent variable. This conclusion is supported by Timmerman et al. (2008) who conducted a meta-analysis of experimental and survey studies ($k = 35$, $N = 11{,}629$) examining the effects of various types of popular music content (by lyric themes). The authors found a clear correlation between musical content and mood effects, as well as between content preferences and individuals' beliefs and behavior. The authors state that "Overall, the results [of the meta-analysis] indicate the exposure to music increases anti-social actions and beliefs" (Timmerman, et al., 2008, p. 314); however, this sweeping statement must be taken in the context that the studies in the meta-analysis mainly examined violent themes and their connection with variables related to aggression.

To show how results of experimental studies are more consistent when organized by dependent variable, a summary of effects found in experimental studies organized by type of dependent variable is presented here. This is followed by a more detailed review

of the same literature organized by methodological issue. Although the studies are organized to represent strengths and/or weakness related to a particular methodological issue, each study does relate to multiple issues and these will be identified where appropriate. It is important to keep in mind that the observed effects are all the result of brief, as opposed to long-term, exposure to songs.

To be included in this section studies were required to have an independent variable of music lyrics and a dependent variable related to behavior, cognition, or affect. Survey studies are excluded here and reviewed in later sections of the literature review (in the sections on survey studies, the sections on individual differences, and the section on music preference) . For studies that contain multiple experiments, only the experiments that focus on lyrics as the independent variable are included. Studies or experiments that include visual stimuli as part of the presentation of the independent variable (i.e., videos) are excluded.

Finally, a major methodological issue identified in these studies is a threat to internal validity resulting from a lack of control for the music that accompanies lyrics. Unless lyrics of different themes are compared in some way that allows a comparison unconfounded by musical stimuli, a note is frequently made that there is no control for music by the standards of this literature review.

Summary of effects: Emotional response. Ali (2004) and Ali and Peynircioglu (2006) found that in certain instances lyrics can detract from emotional responses to music (specifically, lyrics can detract from positive emotions associated with "happy/calm" music). This is consistent with the findings of Stratton and Zalanowski

(1994) who noted that lyrics have an effect on mood regardless of whether they are presented with or without music. Although music alone improved mood, Stratton and Zalanowski found that lyrics depressed mood, whether presented with or without music. On the other hand, Sousou (1997) found that mood is not effected by lyrics – only by music.

Fischer and Greitemeyer (2006) found that misogynistic music lyrics increase men's aggressive affect and man-hating music increases women's aggressive affect. On a more positive note, Greitemeyer (2009a, 2009b) found that prosocial lyrics increase empathy.

Summary of effects: State hostility and aggressive cognition. Anderson, Carnagey, and Eubanks (2003) found significant effects of violent songs on state hostility and aggressive cognition. Cohen (2004) also found that aggressive cognition increased after listening to violent songs and that this effect is moderated by aggressive personality. Fischer and Greitemeyer (2006) found that misogynistic music increases men's aggressive cognition and man-hating music increases women's aggressive cognition.

Summary of effects: Prosocial cognition. Greitemeyer (2009a, 2009b) found that prosocial lyrics have positive effects on prosocial cognition. Suicidal music lyrics also increased prosocial cognition as measured by TAT narratives in a study by Peterson, Safer, and Jobes (2008).

Summary of effects: Arousal. Bagwell (1997) found no significant effect of lyric content on emotional or physiological arousal.

Summary of effects: Suicidal ideation, anxiety, self-esteem. Although Ballard and Coates (1995) found no effect of lyric content or music type on suicidal ideation, anxiety, or self-esteem, they did find that nonviolent rap increased scores on the Beck Depression Inventory (BDI; A. T. Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). They also found that rap songs elicited more angry responses on the STAXI (Spielberger, 1988) than heavy metal songs.

Summary of effects: Style perception. Although some survey studies have found bias against heavy metal and rap (Fried, 1996, 1999; Recours, 2009), experimental studies have had mixed findings. Ballard, Dodson, and Bazzini (1999) found no effect of labeling lyrics as heavy metal or rap on participants' perception of the antisocial qualities of listeners. They did find an effect of the same labeling on participants' perceptions of whether the lyrics will be less likely to inspire prosocial behavior than the same lyrics labeled as country or pop. They also found that, regardless of genre labeling, lyrics with an antisocial message were judged as being most likely to inspire antisocial behavior, and lyrics with a prosocial message were perceived as being most likely to inspire prosocial behavior regardless of genre. In a later study designed to be similar, but including a measure of control for familiarity, Brunner (2006) did find style bias against heavy metal, believing the bias to mainly be a bias against fans of the style rather than a bias against the music. It is possible that the different findings in the two studies could be due to the effects of history in the interim between the two studies.

Summary of effects: Aggressive behavior. Barongan and Hall (1995) found that misogynistic rap music primes sexually aggressive behavior. Similarly, Fischer and

Greitemeyer (2006) found that misogynistic music increases men's aggressive behavior and man-hating music increases women's aggressive behavior. Effects of violent lyrics on aggressive behavior have also been found by Smith (1995), Litman (1996), and Treadwell (2006).

Summary of effects: Prosocial behavior. Greitemeyer's experimental studies (2009a, 2009b) found that prosocial lyrics have positive effects on prosocial behavior. Though not an experimental study, a field study conducted by North, Tarrant, and Hargreaves (2004) also found that, in comparison with "annoying" music, "uplifting" music inspired more high investment helping behavior.

Summary of effects: Racial stereotypes. Rudman and Lee (2002) found that listening to misogynistic or violent rap music increases implicit racial stereotyping. Misogynistic or violent rap also increases explicit racial stereotyping for those with a high prejudice level as determined in a pretest. In another experiment, they also found that rating of African American or Caucasian individuals reflected priming for stereotypes of African Americans for individuals who listened to the violent and misogynistic rap music, but in this instance the effect was not moderated by preexisting level of prejudice.

Similarly, J.D. Johnson, Bushman, and Dovidio (2008) found that exposure to sexually explicit rap music primed negative stereotypes and reduced empathy among Caucasian students toward an African American student-in-need.

Summary of effects: Attitudes toward women. Effects of sexually violent rock music on acceptance of violence toward women were found by St. Lawrence and Joyner

(1991); however, lyrics alone did not produce this effect. Wester, Crown, Quatman, and Heesacker (1997) found no effects of sexually violent rap lyrics alone or lyrics with music on attitudes toward women among men with little prior exposure to rap. Sprankle and End (2009) also found no effects of music with sexual themes on attitudes toward women.

Summary of effects: Sexual attitudes and behavior. Sprankle and End (2009) found no effect of music with sexually themed lyrics on perception of peer sexual activity or attitudes toward premarital sex among college undergraduates.

Summary of effects: Response to lyrics about suicide. Rustad, Small, Jobes, Safer, and Peterson (2003) found that listening to suicide-related lyrics increases implicit suicide-related thoughts. In a study using the same songs with suicide-related themes employed in the Rustad et al. study, Peterson, Safer, and Jobes (2008) found that individual differences (personality traits and a history of knowing someone who had died by suicide) were predictive of responses to suicide-related lyric themes.

Exemplary experiments. In the earliest study to experimentally manipulate music lyrics as an independent variable, Galizio and Hendrick (1972) were able to avoid many of the methodological flaws observed in later studies. The authors examined the effects of sung and spoken lyrics with and without guitar accompaniment on attitude, mood, and recall. The study design allowed for good internal and construct validity using a 2 x 2 factorial repeated measures design. One independent variable was guitar accompaniment (with or without), and the other was the mode of vocal presentation (spoken or sung).

Participants (N = 84 university students, from four different classes taught by the same teacher) were grouped by class. All participants heard the same four songs according to a Latin squares design to control for order effects. ANOVA comparisons were analyzed between the four classes. An analysis of within-subjects factors was conducted for the guitar/no guitar and sung/spoken variables and for the interactions between these two variables. The authors note a problem in analyzing the interactions:

> This mode of analysis allowed a more powerful test of the two variables of interest (the two within-subjects variables and their interaction), since the effects of these variables were averaged over all four folk songs. However, this increased power was obtained at the expense of meaninglessness of all interaction effects which included groups as a term. Since different groups received different folk songs under the four experimental conditions, interactions involving groups could occur simply because of basal differences in rating levels for the four folk songs. This problem was actually of minor importance since the basal level. of scores for a given folk song was not of theoretical interest. (Galizio & Hendrick, 1972, p. 354)

The recall and attitude measure consisted of nine true/false recall items and nine opinion statements. Mood was measured on ten dimensions using a 9-point rating scale. There was a significant effect for guitar vs. no guitar on attitude and nine out of the ten dimensions of mood. There was no effect for guitar vs. no guitar on recall. Significant effects for recall and for three out of the ten mood dimensions were found for sung vs. spoken conditions, but there was no effect for attitude in the sung/spoken conditions. No effect sizes are given.

This study is superior in several ways to many of the studies that have followed because (a) the authors acknowledge that such studies are inherently difficult to design due to the wide-variety of musical variables that are necessary to take into account; (b) the simplicity of the instrumental stimuli used by the researchers provides better internal

validity than studies using more complex musical stimuli, thereby eliminating alternative explanations arising from the use of multiple musical variables; (c) a Greco-Latin squares design controls for order effects of songs and type of presentation; (d) the authors give information about the composer/lyricist, key, duration, and lyrical issue of each song used in the study, making the study suitable for replication; (e) the use of existing folk songs provides for ecological validity; (f) differing musical stimuli are not compared, only differing lyrical presentations. The style of music was folk. The simplicity that lends this study its strength is also its greatest limitation: it does not allow for observation of the effects of more complex music involving differences in production, arrangement, instrumentation, and so on. The authors give a concise assessment of the methodological problems at hand:

> The study of music as a form of communication poses several difficulties. The term music denotes a wide range of stimuli that are not necessarily comparable. Further, individual differences in musical experience and interests may result in a diversity of reactions to the same musical stimuli (Fransworth, 1969). (Galizio & Hendrick, 1972, pp. 350-351)

Anderson et al.'s (2003) series of five experiments considered how to eliminate more sources of error than most of the other studies reviewed. They conducted a series of experiments to investigate the effects of violent and nonviolent lyrics on state hostility and aggressive cognition. In the first two of these experiments, songs from the group Tool, "Jerk Off" and "Four Degrees" (Keenan, Jones, Carey, & d'Amour, 1992; Keenan, Jones, Carey, & D'Amour., 1993) were used for the violent and nonviolent conditions, respectively. The researchers hoped that by using songs by the same artist they would achieve some measure of control for musical differences between the songs. The songs

were identified by requesting suggestions from students from the same population as the participant sample for four pairs of songs that had characteristics such that (a) one of each pair was clearly violent and the other had no or minimal violent content, (b) both songs had lyrics that were easily understandable and comprehensible as recorded, (c) the songs were to be of the same style type and about the same length of play, and (d) both songs should be by the same group or artist. The dependent variable in the first experiment was state hostility. There were two types of participants in both studies ($N = 59$ for each study): volunteers from the general student population and introductory psychology students. The first experiment used a 2 (song) x 2 (sex) x 2 (participant pool) design. Participants listened to one of the two songs. They then completed the State Hostility Scale (Anderson, Deuser, & DeNeve, 1995) followed by an unrelated task. Lastly, participants attended a debriefing. After initial statistical analyses revealed no interactions with sex, the researchers determined that the assumptions for ANCOVA (homogeneity of slopes) were met and analyzed the data as a 2 x 2 analysis using sex as a covariate. Females did score higher on state hostility; however, the researcher hypothesized this could be due to a difference in males and females in terms of liking. In summary, the researchers found significant effects of the violent song on state hostility; however, the effect size was not reported (though the researchers reported the pooled effect size for all five experiments).

Anderson et al.'s (2003) Experiment 2 (also $N = 59$) was identical to Experiment 1 in every way except that the dependent variable in Experiment 2 was aggressive cognition as measured by an adaptation of Bushman's (1996) method using word pairs to

assess aggressive cognition. Participants rated ten aggressive words and ten ambiguous words in matched pairs on a 7-point scale. The pairs were (a) aggressive-ambiguous, (b) aggressive-aggressive, and (c) ambiguous-ambiguous. Participants listened to the song then completed the dependent measure. Lastly, participants completed an unrelated task before being debriefed. The hypothesis in this experiment that aggressive-ambiguous pairs would be rated more similarly by listeners of violent lyrics was confirmed.

For Experiment 3, Anderson et al. (2003) conducted a pilot study to categorize and select songs. Ten songs were rated as violent or nonviolent on a 0 to 10 scale by 50 college students, then two songs were dropped and eight songs were selected for the study. Four of the eight songs were nonviolent and rated approximately 2 to 4 on the violence scale in the pilot. For violent lyrics, the songs rated approximately 7.5 to 8.25 on the violence scale in the pilot. These ratings were confirmed as significantly different at the $p < .0001$ level. The four violent songs were "Shoot 'Em Up" by Cypress Hill (1991); "I Wouldn't Mind" by Suicidal Tendencies (1994a); "Hit 'Em Hard" by Run DMC (Simmons, McDaniels, Coward, Criss, & Gist, 1993); and "Jerk-Off " by Tool (Keenan et al., 1992). The four nonviolent songs were "Live at PJ's" by the Beastie Boys (Beastie Boys, 1992b); "Love vs. Loneliness" by Suicidal Tendencies (Suicidal Tendencies, 1994b); "In the House" by Run DMC (Simmons, McDaniels, & Phillips, 1993); and "Finger Lickin' Good" by the Beastie Boys (Beastie Boys, 1992a).

Experiment 3 used a 3 (song condition) x 2 (dependent measure order) x 2 (gender) factorial design with state hostility and aggressive cognition as dependent variables. In addition to the violent and nonviolent song conditions, a no-song control

group was used. Trait hostility was analyzed for moderating effects. Perceived arousal and gender were analyzed as covariates after Experiments 1 and 2 failed to show a main effect of gender. The researchers were concerned about a crossover effect with trait hostility. Therefore, participants were preselected for trait hostility based on scores on the Caprara Irritability Scale (Caprara et al., 1985) and those with scores in the upper and lower quartiles were selected for participation. Experimenters were blind to the trait hostility scores when calling to arrange participation and when running the experiment.

Participants in the final sample (N = 145 undergraduates) listened to one song each from either the violent or nonviolent groups, or participated in a no-song control group. After listening, participants completed the State Hostility Scale (Anderson et al., 1995); a timed task reading word lists (faster comprehension and labeling of aggressive words represents more aggressive cognition); a perceived arousal scale questionnaire; and a music questionnaire to determine if participants understood the lyrics, were focused on the tasks at hand as opposed to the purpose of the study, were suspicious of the test items, what level of focus they had on the task, and what perceptions they had regarding effects of the song. Due to the fact that media priming effects are short lived on state hostility, task order for the dependent measures was controlled for.

Results confirmed the hypothesis that violent songs increase aggressive cognition. The increase was more pronounced for men than for women. In addition, state hostility increased after listening to violent songs but the effect was only significant when the state hostility scale was administered immediately after listening (as it was in Experiment 1). There was not a significant difference between the song conditions on perceived arousal

or any of the variables assessed on the music questionnaire. This allows for conclusions about state hostility and aggressive cognition to be unconfounded by alternative explanation related to these variables.

Two final experiments were carried out by Anderson et al. (2003). These were similar in design to the previous experiments but used humorous/violent and humorous/nonviolent songs in an attempt to assess whether humor would cancel out the effect of violent lyrics. Experiment 4 was similar to Experiment 3 using a 3 (song) x 2 (order) x 2 (gender) factorial design. The songs used were "A Boy Named Sue" (violent) by Johnny Cash (Silverstein, 1969)and "Hello Mudduh, Hello Fadduh!" (nonviolent) by Allan Sherman (1963). Experiment 5 used a 2 (violent or nonviolent music lyrics) x 2 humorous or nonhumorous lyrics) factorial, with a no-song condition and trait hostility as a continuous independent variable. The two humorous songs were "The Night Santa Went Crazy" (violent; Yankovic, 1996b), and "Gump" (nonviolent; Yankovic, 1996a) by Weird Al Yankovic. The two nonhumorous songs were by the Violent Femmes, "Country Death Song"(violent; Violent Femmes, 2000) and "I Held Her in My Arms" (nonviolent; Violent Femmes, 1990).

The researchers hypothesized that because humor primes positive affect and violence primes negative affect, the competing processes would nullify one another and results on dependent measures would be similar to those of participants in the no-song control group. Furthermore, they hypothesized that both the no-song control and the humorous/violent groups would have higher state hostility and aggressive cognition than the humorous/nonviolent participants because of an additive effect of positive affect for

humorous content plus positive affect for nonviolent content. Results in both experiments confirmed the hypothesis for state hostility, humorous/violent songs and no-song control were not significantly different, and humorous nonviolent songs produced significantly lower scores on state hostility. However, the cancellation effect did not hold true for aggressive cognition.

Anderson et al.'s (2003) series of experiments were exemplary in many ways. They tried to control for music by using the same artists and styles in some experiments and by using a variety of songs in others. They controlled for order effects. They considered the possibility of arousal as an alternative explanation for their findings, tested for it, and ruled it out. Over the course of the five experiments the results consistently showed that violent lyrics increase aggressive cognition and affect as predicted by the general aggression model (Anderson, Anderson, & Deuser, 1996; Anderson et al., 1995; Lindsay & Anderson, 2000). The main possible improvement points for these studies would be to find a way to control for music so that it has no possibility of confounding the effect of lyrics, and to use a more precise method of selecting and quantifying or categorizing thematic content in lyrics.

When the themes examined are more concrete and narrowly defined, it is much easier to design a study with good construct validity. Rustad (1999) and Rustad et al. (2003) conducted two experiments. The first had an independent variable of rock music videos with or without suicidal content. The second experiment is applicable to this literature review because it examined rock music with or without suicidal content. The concept of suicide is very concrete in meaning; therefore, it lends itself to much easier

process of identifying appropriate materials to use for independent variable categories. Participants (N = 104 college students – a sufficient sample size to obtain good power for the statistical tests used in the study) listened to rock music with or without suicide-related content. The songs with suicide-related content, "Dirt" (Cantrell & Staley, 1992), "Desperate Now" (C. Hall, 1998a), and "Fade to Black" (Hetfield, Ulrich, Burton, & Hammett, 1984), were selected by the researchers and matched by artist, genre, length, and theme (anger, lost love) with three control songs with no suicide-related content: "I Stay Away" (Staley, Inez, & Cantrell, 1993), "Haunting Me" (C. Hall, 1998b), and "Nothing Else Matters" (Hetfield & Ulrich, 1991).

In a pretest, two personality measures were given; however, the authors don't say which personality tests were administered and the data from those measures are not analyzed or reported. However, it is noted that individual differences were found in the data and that these are reported in other studies (Jobes, Small, Peterson, Rustad, & Safer, 2000; and Small et al., 2002, both cited in Rustad et al.). Participants were given a copy of the song lyrics and told to follow along with the lyrics as they listened to the three songs. After listening to the songs, participants completed measures assessing mood (PANAS; Watson, Clark, & Tellegen, 1988); suicide-related thoughts (TAT; H. Murray & Harvard Psychological Clinic, 1943); perceptions of personal risk--including risk of suicide (Rothman, Klein, & Weinstein, 1996 adapted by Rustad et al.); sensitivity to suicidality in others and attitudes/beliefs about suicide (SOQ; Domino, Moore, Westlake, & Gibson, 1982); and hopelessness (BHS; A. Beck, Weissman, Lester, & Trexler, 1974).

TAT results revealed that participants exposed to the songs with suicide-related content wrote more stories with suicide-related themes in comparison with the control group, t (102) = 3.91, $p < .001$, indicating an effect of the suicide-related themes on implicit cognition. There were no significant differences on any of the other measures.

Besides the good construct validity achieved in this study, the use of numerous measures to examine a variety of potential effects is another strength of this research. Although probably expensive, and certainly time-intensive (in addition to the time spent completing the numerous measures in the pretest and posttest, it took 20 minutes for the participants to listen to the songs) a great deal of useful and important data were gained from this well-designed study.

Methodological issues: Effect sizes. With exceptions (mainly in more recent studies; e.g., Greitemeyer, 2009b, 2009c) effect sizes have not generally been reported in these studies or they are presented as pooled effect sizes across a series of experiments (e.g., Anderson et al., 2003) so, when significant effects have been found it is impossible to know how meaningful the effects are.

Methodological issues: Construct validity. The problem of categorizing lyric content into groups by theme looms large in the literature (though authors generally do not acknowledge this limitation of their studies in reports). Researchers usually use one of the following methods to define independent variables: nonexpert (musically speaking) researcher or participant opinion, pilot studies, expert opinion, coding systems (rare) or parental advisory labels. The following studies show the strengths and weaknesses of the various methods.

Smith (1995) investigated the effects of alcohol and violent lyrics on aggressive behavior using a 2 (alcohol/no alcohol) x 2 (high vs. low violence lyrics) x 2 (music/no music) factorial design. The lyrics factor was operationalized by counting references (words or phrases) to weapons or violent behavior in 100 songs from the heavy metal genre (no information is given about how the sample of 100 songs was chosen). The three songs with the most violent references were chosen for the high violence condition and three songs by the same artists and with similar tempos to the high violence songs but with no references to violence or weapons were used for the low violence condition. Pearson correlations were obtained as a measure of interrater reliability between two coders in a reliability check using 15% of the sample of songs. The reliability coefficient for lyric content was r = .997, and for tempo it was computed at r = .998.

Despite the seemingly scientific method used to categorize content, this method exemplifies the hazard of using a purely quantitative method to operationalize variables related to meaning. One of the songs chosen to represent the nonviolent condition is "Helter Skelter" (Lennon & McCartney, 1968) by the Beatles. Although this song does not contain violent references according to the prescribed definition for the study, the song has long had an unfortunate association with the history of Charles Manson (who was obsessed with the Beatles) and the murders committed by the Manson Family; therefore, the song is associated with violent connotations for anyone familiar with the facts of the Manson case. Manson believed that the song "Helter Skelter" contained a coded message directing him to play a leading role in a coming race war. The words "Healter Skelter" [sic] were spelled out in blood on the refrigerator of the LaBianca home

on the night Leno and Rosemary LaBianca were murdered by members of the Manson Family. These facts are documented in a bestselling account of the murders written by the prosecutor of the case (Bugliosi & Gentry, 1974) and in a 2-part television movie based on the book (Gries & CBS Television Network, 1976a, 1976b). Further publicizing the obsessive connection Manson imagined between himself and the song, the book and the movie were both named "Helter Skelter" as well. Therefore, the link between the violent history of the Manson Family and the song is well-known, and may have caused a serious problem with the study because the song was meant to represent a low violence condition, but due to the history just discussed, the song may have conjured many violent associations for participants aware of this connection with the song and the Manson Family killings. Associations with songs that may occur on an individual basis may be compensated for by the statistical techniques (ANOVA and MANOVA) used in this study, but these techniques will not compensate for an inadequate representation of the construct that may be due to more widespread associations with a song that are formed on a historical/societal basis rather than on an individual level.

The dependent variable in Smith's (1995) study was aggression as defined as "attempted delivery of noxious stimuli to another" (p. 37) and this was measured using a shock procedure as per Buss (1961) and Gustafson (1984). A heart rate monitor and skin conductance response meter were also used during the experiment. Participants were 152 males over 21 years of age; 90% were Caucasian and all were undergraduate students. Participants were randomly assigned to one of eight conditions required by the 2 x 2 x 2 design of the study. All songs were compared to completely different songs – there was

no control for music by the standard of this literature review. Analyses revealed that the participants exposed to the lyrics high in violent content delivered shocks of longer duration to the fictitious confederate relative to those exposed to lyrics low in violent content. Participants also administered shocks of increasing intensity than durations across trials.

Bagwell (1997) used a two-group comparison design with multiple measures to compare the effect of lyrics (violent vs. nonviolent) on multiple dependent variables (blood pressure, subjective level of anger, state anxiety, and anger). Violent lyrics in this study were defined as those requiring an explicit lyrics warning label according to Recording Industry Association of America (RIAA) standards. Musical styles were defined in accordance with how the music is categorized in record stores The style of music accompanying violent lyrics had to be categorized in record stores as gangsta rap. Neutral nonviolent songs did not have the explicit label and were categorized in record stores as rap. No mention is made in the article of how the specific neutral or violent songs within each genre were selected. A demographic questionnaire was given in the pretest. Instruments used in both pretest and posttest were State Trait Anxiety Inventory state and trait scales (STAI; Spielberger, 1984), the anger subscale of the Aggression Questionnaire (Buss & Perry, 1992), digital blood pressure readings, and a 0-10 scale for measuring subjective anger (Subjective Level of Anger Scale; Bagwell, 1997). Participants were excluded if they were on medication for medical or psychiatric conditions. Participants (N = 30) were male psychology and sociology undergraduates 18 to 26 years old. Participants in each condition listened to two songs (violent or

nonviolent) before completing the posttest measures. No moderators or covariates were analyzed. No significant effects were found for any of the comparisons in the study.

The method used to categorize the lyrics in the above study is low in validity because the method used by the RIAA to assign warning labels is a highly subjective procedure applied by record labels and artists on a voluntary basis (Recording Industry Association of America, 2006). Motivations to apply or not apply the warning label differ and include a variety of commercial considerations.

In Ballard and Coates' (1995) study, songs defined as being either homicidal, suicidal, or nonviolent were the independent variable. Homicidal, suicidal, and nonviolent songs were identified in a pilot study and operationally defined by the opinion of undergraduate students ($N = 16$) using Likert scale ratings for familiarity, comprehension, and lyric type (homicidal, suicidal, or nonviolent). Six songs were chosen for the study. The three heavy metal songs that were selected were "Of Wolf and Man," "Assassin" (homicidal), and "Falling Asleep" (suicidal). The rap songs that were selected were "Sunny Meadowz" (nonviolent/control), "Peel Their Caps Back" (homicidal), and "Ever So Clear" (suicidal). No citations or references for these songs are given in the published study. The dependent variable in this study was mood. The instruments used were a memory for lyric questionnaire, the State Trait Anger Expression Inventory (STAXI; Spielberger, 1988; Spielberger et al., 1985), State Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Edward, 1970), Beck Depression Inventory (BDI; A. T. Beck et al., 1961), Adult Suicidal Ideation Questionnaire (ASIQ; Reynolds, 1991), and the Self Esteem Scale (SES; Rosenberg, 1965). The method was a posttest

only. Participants (N =174 undergraduates) were told the study was a memory for lyrics experiment. They were also told that they could participate in a second, unrelated experiment on personality (for extra credit) if they chose to at the end of the first experiment. The purpose of this deception was to try to distract participants from connecting the songs to the mood measures (which participants believed were personality tests). Participants were randomly assigned to groups and heard one of the six songs in groups of 5 to 10 participants. Next, they took the memory questionnaire; if they agreed to go on to the second experiment they signed a second consent (ostensibly for another experiment/experimenter) and took the rest of the measures. Effects of music were not controlled for. The songs were six totally separate songs and there was no control group. In summary, Ballard and Coates found no effect of song content or music type on suicidal ideation, anxiety, or self-esteem. The nonviolent rap song resulted in higher Beck Depression Inventory scores than the violent rap songs. The rap songs also resulted in significantly more angry responses than heavy metal songs. Improvements to this study design could include adding a pretest to assess mood prior to listening to the songs, using order as a factor, giving the measures of affect to some of the participants directly after listening to the song, using a more precise way to categorize thematic content, and including a control group.

Ballard, Dodson, and Bazzini (1999) designed a study to test the hypothesis that lyrics labeled heavy metal or rap are judged more negatively than lyrics labeled pop or country due to a cultural style bias. The independent variable was lyrics (antisocial and prosocial) which were labeled as being either heavy metal, rap, country, or pop. The

researchers state that the songs were obscure; however, it is not specified how this was determined. The song lyrics were selected in a pilot study. The researchers chose six songs: three they believed to be antisocial and three they believed to be prosocial. The researchers state that the lyrics presented could belong to any of the musical genres used in the study, but how this was determined is not described. The six song lyrics were presented to raters ($N = 118$; no other characteristics of pilot study participants are given) in the form of lyric sheets only. Two lyrics were chosen in the pilot study to be used in the main study. The lyrics from the song "Give it Up" (O'Maoniai, O'Braonain, O'Toole, Barnes, & Fehily, 1991) and the lyrics from the song "This Is the Night" (M. Johnson, 1992) were chosen as prosocial and the antisocial lyrics, respectively.

Participants in the main study ($N = 160$, 98% Caucasian, 2% African American, 85 men, 19 women, and 19 unidentified undergrads) were presented with one lyric, either the prosocial or antisocial lyric labeled as either heavy metal, rap, country, or pop. After reading the lyric, they began work on a series of questionnaires. First, to assess participants' perception of the lyric's theme, they were asked, "What is the main theme being promoted by the lyrics?" and asked to rate this on a 7-point Likert-type scale ranging from prosocial to antisocial. The dependent variable was perception of the likelihood of the lyric having an effect on behavior. Perception of likely behaviors was measured using a Likert-type questionnaire derived from Wass et al. (1988) asking for participants' perception of how likely the lyrics they had read would be to inspire various behaviors ranging from prosocial to antisocial. Demographic and musical preference questionnaires were also administered.

In summary, the researchers found that the lyrics labeled as heavy metal or rap would not be perceived as more likely to inspire antisocial behaviors than the same lyrics labeled as country or pop (contrary to the corresponding hypothesis). Three hypotheses were supported in the study. First of all, lyrics that were labeled as heavy metal or rap were perceived as being less likely to inspire prosocial behaviors than the same lyrics labeled as country or pop. Secondly, lyrics with an antisocial message were perceived as more likely to inspire antisocial behavior than lyrics with a prosocial message regardless of genre labeling. Lastly, lyrics with a prosocial message were perceived as being more likely to inspire prosocial behaviors than lyrics with an antisocial message regardless of the labeled style. Eighty-three percent of the participants in the study reported believing that song lyrics influence people's behavior. The findings of this study are important to consider in the research design because they indicate that style attributions, rather than content, can be responsible for judgments made by participants.

Although demographic data were gathered in this study, ethnicity was not included as a covariate in the analysis of the data. The authors acknowledge the demographic homogeneity of their sample in terms of age and ethnicity; however, analyzing demographic data might have yielded more information despite the lack of heterogeneity in the sample. Likewise, although the researchers analyzed descriptive statistics for the preference data (determining that random assignment had spread preferences evenly across the groups), analyzing the preference data as a covariate might have also yielded other interesting data. The forced choice of thematic content on a continuum from prosocial to antisocial did not allow participants to give more

information about how they perceived the lyric themes and this information could have also been valuable. As for the selection of song lyrics, although there was a large group of raters to choose the two songs from the six presented, the small number of researcher-selected songs created potential error in the validity of song selection.

Cohen (2004) investigated the effect of lyrics and beats/rhythm on mood and cognition in adolescent males aged between 18 and 24 years ($N = 104$ undergrads participating for course credit) using violent or nonviolent music as the independent variable. Cohen does not explain how the independent variable was defined other than to say that the investigator picked songs that had either a soft beat or a hard beat (though they can refer to subgenres of rap, "soft beat" and "hard beat" are not descriptors generally used in musical terminology). Cohen states that songs with soft beats were country and songs with hard beats were rock (not rap). The comparisons would have been subject to many extraneous variables due to style differences between country and rock. The participants either listened to the hard or soft beat music. The dependent variable in this study was aggressive cognition and mood measured via narratives, a trait aggression questionnaire, and a mood scale. The participants were frustrated with a word puzzle in between completing the narrative task and the mood scale. The experiment demonstrated that aggressive males listening to violent music with soft beat were more likely to express aggressive themes in their narratives than nonaggressive males listening to violent music with soft beat. Aggressive males reported less confidence after a frustrating task than nonaggressive males. Carryover effects from the narrative task may have impacted the results of the mood measure. Participants who listened to soft beat were more confident

than those who listened to the hard beat. Individuals reported feeling more relaxed after listening to nonviolent lyrics and violent lyrics. Although the results of this experiment are interesting the hard/soft beat comparisons were confounded by style differences – a classic case of comparing apples to oranges.

In a study of priming effects of lyrics on social judgments, Rudman and Lee (2002) found that implicit negative stereotyping of African Americans is increased by priming with violent and misogynistic rap lyrics whether individuals are high or low in prejudice before priming . Explicit negative stereotyping after priming was dependent upon prejudice level in one experiment, but not in another. The independent variable violent and misogynistic rap music was represented by songs that were researcher selected; there was no pilot study. The reasoning for selecting the songs was not given in the published report. The dependent variable was social judgments. In a pretest participants completed the Modern Racism Scale (McConahay, 1986), which was ostensibly administered as part of an unrelated experiment. In the posttest participants were asked to give consumer ratings of songs (the cover story was that the study's purpose was marketing research of songs) then the subjects were asked "as a favor to the experimenter" to help with preparing for a future project and that is when the participants completed the instruments that actually measured the dependent variable: an implicit and an explicit measure of social judgment. All the participants elected to participate in this part of the experiment. The instrument used to measure implicit social judgment was the Stereotype Implicit Association Test (SIAT; Greenwald, McGhee, & Schwartz, 1998; Rudman, Greenwald, & McGhee, 2001; Rudman, Greenwald, Mellott, & Schwartz,

1999). An instrument designed by the researchers was used to measure explicit judgments. The explicit measure asked participants to estimate the percentage of African Americans and Caucasians with characteristics measured in the SIAT. There were 30 participants; 15 men and 15 women who participated in exchange for partial credit toward their introductory psychology experimental requirement. Of these, 14 (46%) were Caucasian, 11 (37%) were Asian, and 5 (17%) used another (non-African American) ethnic identification. There was no control for music by the standards of this literature review. Gender and race were evaluated as covariates and if significant they were tried as factors in the 2 (songs) x 2 (high/low prejudice) x 2 (some analyses had race, some gender depending on the results of the preliminary analysis--most were done with gender) design. Like many studies in the literature, this study claims to be comparing "music" that is violent or misogynous, when it is more accurate to state that only the lyrics may be labeled so; hence, many of the studies reviewed show in their very titles (for example, the title of Rudman and Lee's study is "Implicit and Explicit Consequences of Exposure to Violent and Misogynous Rap Music") a possible researcher bias against particular genres of music.

Wanamaker and Reznikoff's (1989) study examined the effect of aggressive or nonaggressive rock music. The musical selections were researcher selected and then subjected to a pilot study. Two songs performed by Mötley Crüe, "Louder Than Hell" (Sixx, 1985) and "Tonight (We Need a Lover)" (Neil & Sixx, 1985), were chosen by researchers for the aggressive condition because Mötley Crüe is "a heavy metal band often criticized for the aggressive content of its music" (Wanamaker & Reznikoff, 1989,

p. 564). To the contrary, Mötley Crüe is more known for party music, what Weinstein (2000) has called heavy metal of the "Dionysian" variety, than for violent or aggressive themes. The band is also known mainly for their Dionysian-type, hard-partying behavior: "lite-metal groups like Poison and Mötley Crüe were into decadence" (Weinstein, 2000, p. 279), though Wanamaker and Reznikoff state that Mötley Crüe is known for aggressive behavior. The two songs chosen for the nonaggressive condition were sung by Stryper, a heavy metal Christian band, "whose lyrics praise God and encourage listeners to follow Jesus" (Wanamaker & Reznikoff, 1989, p. 564); and two songs, "In my World" (Hayward, 1981) and "Nervous" (Lodge, 1981), sung by the Moody Blues (a band characterized by the authors as being nonaggressive and mellow, but that I would suggest may sound sad as well).

In the pilot study, 10 graduate students (4 men and 6 women) were given the lyrics to the six researcher-selected songs and asked to rate them for aggression on a 7-point scale while listening to the music. During a second listening, the participants were asked to rate the music for aggressiveness. Aggressive lyrics were defined as having "descriptions of 'any violent or harmful acts toward the self or others'….Aggressive music was defined as songs with a 'hard, driving beat, yelling, tension, and dissonance'" (Wanamaker & Reznikoff, 1989, p. 564). The song "In My World" was chosen for the nonaggressive music and lyrics condition, "Louder Than Hell" for the aggressive music and lyrics condition, and "The Way" (Fox, 1986) for the aggressive music/nonaggressive lyrics condition. Here again, the method of categorizing lyric themes seems to fail the researchers. Although "Louder Than Hell" does have references to aggressive behaviors,

the overall message of the song is that the singer chooses to be "louder than hell" (i.e., play rock music) as an alternative to being violent. Although the song may fit the operational definition for aggressive lyrics in the study, there are enumerable heavy metal songs that could have better represented the construct of aggressiveness. By giving the pilot study participants so few choices of songs to rate, the researchers may have created demand characteristics that encouraged the relative scoring of the songs rather than the scoring of each song on its own merits. It is possible that the researchers, who seem to be unfamiliar with heavy metal culture, may not have comprehended the theme of the song "Louder Than Hell." The other song by Mötley Crüe that was used in the pilot study, "Tonight (We Need A Lover)" is sexual in content and is about the band's quest for groupies. "Nervous" by the Moody Blues is nonaggressive by the study definition, but has lyrics that would likely evoke other strong emotions. The song begins

> Why am I so nervous
> Please explain to me
> Why I can't sleep
> I close my eyes to shelter
> In the dark I try to hide
> If you leave me on my own
> I'm worried I could lose my way

and continues in a similar vein. This content of the songs seemingly forced the choice of which Mötley Crüe or Moody Blues song would be chosen, making the pilot study very low in validity and decreasing the overall internal and external validity of the study.

The dependent variable was hostility as measured on projective and objective tests: the TAT (H. Murray & Harvard Psychological Clinic, 1943) and the Buss-Durkee Hostility-Guilt Inventory (Buss & Durkee, 1957). TAT stories were scored for aggressive

content. Participants (N = 90 undergraduates) wrote stories suggested by the TAT during a 20-minute period during which they listened to the same song repeatedly. Participants were provided with lyrics during the listening period. After the listening period, participants were asked to write down what they thought the main theme of the lyric was and to indicate if they had heard the song before.

In summary, the authors indicated that "the results support the hypothesis that many teenagers do not attend to rock music lyrics and that lyrics do not affect aggression. There also was no evidence that different types of music apart from lyrics influence aggression" (Wanamaker & Reznikoff, 1989, p. 567). However, the results indicating a lack of attention to lyrics might be due to a misattribution of the meaning of the lyrics on the part of the researchers. It is possible that participants understood the meaning of the lyrics in a different (though not incorrect) way that conflicted with the researchers' opinion of what the "correct" interpretation of the lyrics should be. The lack of an observed effect of lyrics on aggression could also be due to the use of the materials chosen. In addition, threats to validity may have existed due to playing the same song for participants over and over during a 20-minute period. Musical preference increases with repetition and preference influences effects of music and lyrics (Ali & Peynircioglu, 2006; Gowensmith & Bloom, 1997; St. Lawrence & Joyner, 1991).

Wiehe (1996) examined the effect of music on lyrical messages and the relationship between these two factors. The independent variables were lyrics drawn from style clusters and the mode of lyric presentation (natural song format or spoken format). There were three pilot studies prior to the main study. In the first pilot study, nonexperts

(*N* = 84 undergraduates in a psychology class) rated music for style classification. The style ratings were then used to conduct a hierarchical cluster analysis to create style clusters. In the second pilot study, "musical experts" (DJs) identified songs that would fit each of the previously identified style clusters. In the last pilot study, the clusters were further narrowed by more DJs. Hence, the combination of the use of nonexperts, experts, and statistical analysis to identify songs for the study provided a system with a diversity of sources; therefore, the method may have been less prone to bias than many of the other methods used to categorize themes in popular music in psychological studies.

In a 2 x 5 factorial design, three assessment instruments were used in the main study to measure the dependent variables (liking and meaningfulness): (a) a semantic differential scale (Osgood, Suci, & Tannenbaum 1957, as cited in Wiehe, 1996); (b) four Likert-type questions that asked directly about the listener's perception of the depth, clarity, intensity, and pleasingness of the lyric; and (c) a series of qualitative open-ended questions. The main study had 148 participants (undergrads in a psychology class). Each participant heard five songs from one of the style categories--the order was not randomized (so there could have been order effects for songs). This study is different from most of the others in this review because of the fact that style as a musical element is being studied rather than specific songs selected to represent psychological constructs. The study results revealed that the presence of music had a statistically significant main effect on listeners' judgment of all of the semantic differential scales and on two of the four Likert-type items. In addition, participants judged lyrics as being of better quality, more active, more meaningful, more intense, and more pleasing when presented with

music, regardless of style, as compared to lyrics in a spoken format. There was no difference between the groups in terms of participants' perceptions of clarity of the lyrics.

Methodological issues: Internal validity. Fischer and Greitemeyer (2006) collected suggestions from psychology students for rock, pop, and rap songs that had misogynistic, man-hating, or neutral lyrics. They asked the students to suggest songs that clearly had misogynistic or man-hating content, and for songs that had no such content, the lyrics of each of the songs had to be from comparable music genres and play for about the same length of time. A pilot study was conducted with 24 participants from the same participant pool as the main study to evaluate whether the misogynistic and man-hating songs were clearly more misogynistic, man-hating, and aggressive in content than the neutral songs. In the first experiment in this study, the dependent variable was aggressive behavior. This was operationalized as the willingness to administer hot chili sauce on a sandwich to another individual. In Experiment 1, participants (N = 161; 88 male, 73 female, ages 19 to 60) were led to believe the research was for a seemingly unrelated task related to marketing research. In Experiment 2 (N = 152; 75 female, 77 male, ages 19 to 54), aggressive thoughts were measured by two items surveying aggressive cognition by means of a word association test. In Experiment 3 (N = 107; 56 female, 51 male, ages 18 to 49), aggressive thoughts were assessed using a word completion task, affect was assessed using a free recall measure to describe feelings toward men and women, and aggressive behavior was assessed by a procedure whereby participants were asked to assign an amount of time for participants to keep their hands in ice water in a future experiment (it was explained that over 25 seconds would be painful).

In all three experiments study participants were students participating for course credit. The study did not control for the effect of music that accompanied the lyrics. In summary, the findings were that misogynistic music increases men's aggression toward women, and man-hating music increases aggression toward men. Gender was analyzed as a factor in this study, so the first experiment in the study utilized a 2 x 2 x 2 factorial design. Experiments 2 and 3 were 3 x 2 x 2 factorial designs. The general aggression model (Lindsay & Anderson, 2000) was used as a theoretical framework and the authors discussed previous research (e.g., Anderson et al., 2003; Ballard & Coates, 1995; Barongan & Hall, 1995) stating that the limitation of past research is the lack of behavioral measurement of aggression, which they addressed in this study. Here, as with the majority of these studies, the comparison between the lyrics was possibly confounded by interactions with the music; however, the categories for lyric themes were more narrow than in many studies, so construct validity is strengthened.

St. Lawrence and Joyner (1991) studied sexually violent heavy metal music in comparison with Christian heavy metal music, or classical music. Lyrics in the sexually violent heavy metal condition seem to fit the target construct; however, the authors' published report only gives details of excerpts taken out of context. There were a total of five songs used so it is possible that in the many lyrics not reported there might have been conflicting types of content. The actual song titles are not given in the article so it is impossible to follow up on this. The songs in the sexually violent condition were chosen because they were judged by the PMRC to contain violent misogynistic content. The PMRC is a highly biased source of information with a political agenda related to music

lyrics. It was not discussed how the Christian songs were chosen, other than that the songs' lyrics portrayed Christian values and behavior. The third condition, easy listening classical music, was chosen for selections of equivalent length to the selections played in the other conditions. The authors state that the music in the easy-listening classical condition was similar to Muzak. This is a confusing reference because the term "Muzak" ordinarily refers to "canned" music played in retail or business settings (so-called "elevator music"). The term has negative connotations and usually implies music of low production quality. The six dependent variables were sexual stereotyping, adversarial sexual beliefs, acceptance of interpersonal violence, rape myth acceptance, attitudes toward women, and sexual arousal. Music preference, religion, and gender role identification were analyzed as covariates.

The research design was a 3 (type of music) x 2 (time) repeated measures design, with Test 1 (T-1) and Test 2 (T-2) one month apart. The experimental manipulation occurred at T-2. Measures given at T-1 were the Intrinsic-Extrinsic Religious Orientation Scale (Allport & Ross, 1967; Feagin, 1964), the Bern Sex Role Inventory (Bern, 1974), the Attitudes Toward Women Scale (Spence & Helmreich, 1972), and the Sex-Role Stereotyping, Adversarial Sexual Beliefs, Acceptance of Interpersonal Violence, and Rape Myth Acceptance subscales from the Sexual Attitudes Survey (Burt, 1980). The measures were given again at T-2 after the experimental manipulation. Sexual arousal was also measured by self-report. Participants were 75 male undergraduates 18- to 24-years-old randomly assigned to the conditions. At T-1, participants were told they were participating in research related to college students' attitudes. At T-2 they were told they

were participating in a consumer evaluation of music. Participants were asked to identify the gender of the singer they heard and the type of music they heard in order to check whether participants paid attention to the experimental stimuli. No significant effects for lyric content were found, but effects were found for heavy metal music regardless of lyric (for sex role stereotyping & attitudes toward women) in comparison with the easy listening music. There were no significant differences between the effects found for Christian or sexually violent lyrics. A weird finding was that easy listening music increased sexual arousal. The authors said, in retrospect, they would have liked to have had a follow-up assessment to see whether the negative shifts produced by the music endured over time. They also recommended that future research should address methodological constraints of experimenters' gender and participants' unfamiliarity with the type of music. Although this study is unique and interesting, especially due to the use of two time points to collect data, unfortunately, as in many of the other studies reviewed, numerous threats to internal validity result from the lack of unconfounded comparisons between conditions.

Treadwell (2006) compared the effects of violent, nonviolent, or no music conditions on physiological, affective, state anger, and aggressive behavioral responses. Prior to the study, participants ($N = 67$ male introductory psychology students) were asked not to sign up for the study if they were currently taking any prescription medications. They were also made aware that they would be asked to observe the following guidelines: (a) not smoke an hour before the study, (b) not consume caffeine 5 to 6 hours prior to the study, (c) not drink alcohol 5 to 6 hours prior to the study, (d) not

exercise an hour prior to the study, and (e) not take any over-the-counter medication before coming in for the lab session. Hence, participants were self-selected based on their ability to follow these requirements, and selection bias is a possible threat to the study's validity.

Participants assigned to the two experimental conditions were exposed to either a 4-minute violent or nonviolent audio clip (based on the same violent and nonviolent music selections that were piloted and subsequently utilized in Anderson, Carnagey, & Eubanks, 2003). A pretreatment questionnaire packet given to all participants consisted of the following: (a) a Demographics Questionnaire, (b) the State-Trait Anger Expression Inventory-2 (STAXI-2; Spielberger, 1988-1999), (c) the Positive and Negative Affect Schedule (PANAS; Watson, et al., 1988), and (d) the Cook-Medley Hostility Scale (W. W. Cook & Medley, 1954). To measure physiological arousal, heart rate and blood pressure baseline were established over a 6-minute time period. Music selections were then played. Heart rate was measured continuously during the experiment and blood pressure was taken at minutes 1 and 3. At posttest the state anger subscale of the STAXI-2 (Spielberger, 1999) and the PANAS (Watson et al., 1988) were administered. Participants were encouraged to complete the questionnaires based on their experience during the past 4 minutes. Next, participants were given a frustration task with numbers. After the frustration task, participants again completed the PANAS (Watson et al., 1988) and also the revised Aggressive Provocation Questionnaire (APQ; O'Connor, Archer, & Wu, 2001, as cited in Treadwell, 2006). In addition, participants in the two experimental groups were asked to complete a debriefing questionnaire consisting of two items that

asked participants to indicate whether or not they had heard the exposure music before, and if so, to further explain and rate how well they understood the lyrics of the music.

Music is controlled for only in the sense that there is a no music control group. This study suggested that exposure to music with violent lyrics and subsequent provocation may contribute to increased aggressive behavioral action responses among undergraduate college males. Music preferences did not play a role in the posttest anger, affective, or physiological responses.

In a study that *does* include an experiment that compares different lyric themes using the same music, Stratton and Zalanowski (1994) conducted three experiments utilizing the song, "Why was I Born?" (Hammerstein II & Kern, 1929), for experimental material. "This song was chosen for the depressing emotional quality and for its unfamiliarity to the average college student... these lyrics are clearly sad and depressing" (Stratton & Zalanowski, 1994, p. 175). No pilot studies were done to confirm this assumption and it is not mentioned whether the music was also considered to have these affective qualities (though it is mentioned that the tempo is slow, other musical attributes of the song are not discussed). In Experiment 1 the dependent variable was mood assessed by the MAACL-R (Zuckerman & Lubin, 1985). Liking was also assessed on a 1 to 10 very unpleasant to very pleasant rating scale. Participants were 24 female and 16 male undergraduate college students in an introductory-level music appreciation course or an introductory psychology course; none were music majors. The three levels of the independent variable were melody played on the piano alone, lyrics recited without music, and lyrics sung with piano accompaniment. A female theatre professor performed

all three versions. The musical versions were 2 minutes in length and the spoken version was only one minute in length. The researchers stated that “the recitation was shorter because the lyrics were repeated twice in the singing version. Reciting the lyrics twice seemed unnatural and we felt a single repetition would be preferable despite the shorter time" (Stratton & Zalanowski, 1994, p. 175). Lyrics were not compared to one another in this part of the study, so the issue of control for music does not arise; however, a more direct comparison would have been to (a) add a condition with sung lyrics and no piano accompaniment, and (b) speak the lyrics in their entirety, including with the repetition of words, to make a more ecological and internally valid comparison. A significant effect of music and lyrics and lyrics alone on mood was found. Although music alone improved mood, the two conditions with lyrics depressed mood. Also, participants liked the music alone better. The researchers attribute the differences to the lyric; however, an alternative explanation could be an effect of not liking the vocal presentation (participants also found the music alone more pleasing).

In the second experiment, three new versions of the song were created. The first was a recording of the melody arranged with a faster tempo and with some “jazz elements” added. The authors do not detail what these were, but they may have included melodic or rhythmic alterations or embellishments. The second new recording was of the vocal and piano accompaniment in the faster tempo, and again with “jazz-type elements…in this up-beat style” (Stratton & Zalanowski, 1994, pp. 177-178). The third version created for Experiment 2 was the music recorded in the original tempo and style but with a new “pleasant” lyric sung to the melody. The pleasant lyrics are given in the

report and it is noted that they were created for the experiment, but who composed the lyrics or how they were composed is not described. The authors state that the "lyrics clearly portray pleasant romantic sentiments commonly found in love songs and are consistent with a pleasant easy listening interpretation of the melody" (p. 178). This is not confirmed in a pilot study or by any other means. After listening to the musical selections, participants' ($N = 44$; 21 male and 23 female undergraduates from the same classes as Experiment 1) mood was assessed as it was in Experiment 1. The findings were that even with the up-tempo music, the sad lyrics still depressed mood; however, an alternative explanation for this effect could be that the music/lyrics combination was perceived as incongruent by the participants. In addition, the researchers missed a golden opportunity to compare the unconfounded effect of the pleasing lyric to the effect of the depressing lyric. By adding one more condition with the original music and lyric at the original tempo and in the original style, a parallel comparison with high internal validity could have been made between the two lyrics.

In the final experiment, participants were also played distractor melodies. Mood and liking were assessed the same way as in the previous two experiments. Participants ($N = 40$; 24 women and 16 men from the same sample used in the prior experiments) rated the music as being less pleasant one week later when the music was paired with the sad lyrics. The authors concluded from all three experiments that lyrics add significantly to the mood effects of music; however, because this particular song is in a major key (frequently associated with "happy sounding" music) it is possible that, although without the lyrics the music would have a significantly *different* mood effect detected in the

statistical analyses (t-tests and ANOVAs), that would not mean that the lyrics *add* to the effect of the music; but rather, that in this case they *changed* the mood effect. As part of their discussion, the authors hypothesize that cognitive dissonance may indeed have played a role in some of the observed effects.

Methodological issues: Ecological validity. As previously discussed, the problems of designing valid methodology in this realm are daunting. Some researchers studying popular music have made the decision to exclude music with lyrics (using only instrumental music) or to use music with lyrics in a language other than one that participants are familiar with in order to skirt the thorny issue of the music/lyrics interaction (e.g., Chavez, 2008). This approach lacks ecological validity for studying popular music of any genre. Popular music includes both music and lyrics in the vast majority of cases. Even in the case where lyrics are unintelligible to listeners due to the style of vocalization, or even if the language of lyrics is different from that spoken by the listener, vocals are an important feature of popular music and convey emotional communication and perceptual input to the listener that may lead to a variety of psychological effects. Even nonsense words or words in an unknown language can create a superficial sense of meaning (Garcia & Bargh, 2003) in terms of an automatic judgment of words being "good or bad." Chavez (2008) states that because lyrics and music are confounds to each other they must be studied separately. This approach, although better than ignoring that the interaction may exist, does not allow for the study of popular music in a naturalistic manner. Chavez defined his study material as being music only, citing the

methodological confound in a previous study (Gowensmith & Bloom, 1997) that did not control for lyrical differences when studying heavy metal music.

At the expense of ecological validity, Ali (2004) and Ali and Peynircioglu (2006) went to great lengths to achieve good internal validity as they sought to discover whether music and lyrics play an equal role in producing affective responses to songs. To their credit, the authors are aware of the main problem in psychological studies of popular song: lack of control for music when studying lyrics. Explicitly stating their concern that "in all such studies to date, either the effects of the presence or absence of lyrics and the type of music were confounded, or there were no control conditions (i.e. music without lyrics) to tease out the effects of the lyrics per se" (p. 512), the authors made efforts to achieve better control by creating pairs of music and music and lyrics for stimuli.

A complicated procedure was employed to create the materials. First, eight melodic excerpts of existing instrumental pieces of music from the classical, jazz, and soundtrack genres were selected to represent each of the four affective qualities in the circumplex theory of emotion (Russell, 1980) as adapted by North and Hargreaves (1997). Selection of the excerpts was achieved using pilot studies (described below). Ultimately, a total of 32 musical excerpts were used in the study. Next, 16 lyrics from unrelated songs were chosen to represent each of the same four types of affective qualities (happy, sad, calm, angry). Each lyric was fitted to two melodies corresponding to a matching emotion. The authors state that the lyrics were "modified" to fit the music; however, it is not described how this was done. The original recorded music was used

and two versions of each unique music/lyric combination were recorded: one each with a female or a male vocalist.

To control for familiarity, pilot studies determined that the music and lyrics used in the study were not highly familiar to the study population. The pilot studies confirmed the categorization of music and lyrics according to the circumplex theory of emotion (Russell, 1980) as adapted by North and Hargreaves (1997). Music and lyrics were sorted into four groups (happy, sad, calm, and angry) by four raters. Though the authors state that pilot studies were "extensive," no description of the qualifications of pilot study raters is given. To be included in the study three out of four raters had to agree upon a category designation for a particular lyric or piece of music.

The researchers conducted six experiments (four experiments are described in both Ali, 2004 and Ali & Peynircioglu; two other experiments are also described in Ali, 2004). Two of these experiments are relevant to this review. In the first of these, participants were compared in a 4 (happy, sad, calm, angry) x 2 (women, men) x 2 (music and lyrics or music only) factorial design. Participants ($N = 32$; 21 women and 11 men) were either university students who participated for extra credit in a psychology course, or research personnel at the National Institutes of Health who participated on a voluntary basis. This sample size is very small considering the complexity of the design.

Participants listened to 20-second excerpts of music and completed ratings on emotion clusters (using a 9-point scale) during or after listening to each of the 32 excerpts. Results revealed an effect on mood: Lyrics enhanced so-called negative

emotions to sad and angry music, but lyrics detracted from emotional responses to happy and calm music.

Experiment 2 used a 4 (happy, sad, calm, angry) x 4 (music/lyrics congruent, melody congruent/lyrics mismatched, lyrics congruent/melody mismatched, mismatched overall) design. Materials were rerecorded so that lyrics and music were created for the mismatched conditions (e.g., happy music with sad lyrics). Participants were university students who participated for course credit and the chance to enter a drawing for $100 (*N* = 32, 19 women and 13 men – again a very small sample size considering the complexity of the study design). After listening to the excerpts participants again rated their emotional judgments of the material on a 9-point scale. It is not clear from the reports whether the participants were to report felt emotion or cognitive attributions.

In both experiments, results were analyzed for main effect of gender. Results were also analyzed for interactions between gender and gender of vocalist. In Experiment 2, the data were also analyzed for possible interactions between gender and congruence. No interaction effects were found. However, it was revealed in the study that when music is presented without lyrics women rate the emotion associated with the music as more intense as compared with the same music with lyrics. Participants rated emotion in a manner more consistent with the emotional categories assigned to the music; therefore, the results of Experiment 2 indicate that music is more important than lyrics in conveying emotion.

Ecological validity is a major concern in this study. The method used to create the study materials is highly contrived. Although the melodies were professionally recorded

and released materials, the lyrics were recorded in circumstances that are only slightly explained (the location of the recordings is given and some of the equipment used is listed). The experience and qualifications of the vocalists are not given. These problems could lead to an alternative explanation of the results: that the difference in the quality of the recordings and performance of the vocalists vs. the instrumentalists, and/or the awkward presentation of the lyrics and music that were never meant to be together was responsible for the findings.

Another possible confounding element in this study is the fact that some of the participants heard the music individually and some in groups. Social factors that could have influenced results may have entered into the group situation. Also, it is not entirely clear how the randomization of the song presentation was accomplished. Carryover effects may have been a problem because the emotional effects of one excerpt may have lingered into the next one. Overall, although this experiment suffers from a number of design problems, the effort to increase internal validity by controlling for music is a good one.

In an investigation of the effects of rap music on aggressive behavior in boys Litman (1996) employed a 3 (lyric, no lyric, control) x 2 (cooperative or competitive) design. The control condition had no music and no lyric. Songs were chosen based on *Billboard* rankings. The author states the purpose of the study is to look for effects of rap music, but the type of rap music is not specified. Songs were selected from *Billboard* charts; however, the author doesn't specify exactly how selection of songs for the study was made. Radio versions with expletives deleted were used; therefore, although this may

have been ethically necessary, the ecological validity was compromised by this practice. It may have been a better solution to choose rap songs that did not require censoring. Videotapes were used to measure (by coding) the rate of verbal and nonverbal aggressive behavior displayed in each condition while dyads listened to music and performed competitive (playing table hockey) and cooperative (mapping) tasks. Participants were 60 males in grades 3 through 5. Aggressive behavior was low in all groups but there were some differences: "the rate of aggressive behavior was low in all dyads, and aggressive behavior was generally followed by nonaggressive response" (Litman, 1996, p. ii). There was a significant effect of lyrics in that the lyric group was higher on nonverbal aggressive behavior than either of the other groups.

Employing methodological changes designed to produce more definitive results, Sousou (1997) reexamined the hypothesis originally formed by Stratton and Zalanowski that “lyrics which convey a clear affective message would control mood changes and the presence of music would serve to intensify the effect of the lyrics” (Stratton & Zalanowski, 1994, p. 175). The independent variables happy/sad lyrics and no music/happy music/sad music were studied in relation to the dependent variables mood, affect, and memory for lyrics. Two musical selections were chosen to represent happy and sad music. The songs were then evaluated by two professional musicians. On the basis of tempo and key, the musicians agreed with the researcher that Mozart's (1787) Eine Kleine Nachtmusik was happy and Barber's (1936) Adagio Pour Cordes was sad. Lyrics for the sad lyric condition were taken from the previous study (Stratton & Zalanowski, 1994) and from a book of folk song lyrics. “The Happy Lyrics were obtained

by substituting happy words for the sad and/or negative wording of the Sad Lyrics, keeping the number of syllables in the lyrics constant" (Sousou, 1997, p. 34) This is not such an awkward method of lyricwriting as it might at first seem. In fact, Pattison's (Pattison, 1991a, 1991b, 2001) highly-regarded technique for analyzing and writing lyrics, which is taught at the prestigious Berklee College of Music, is highly dependent on a system of analyzing words for syllables and patterns of rhyme and stress. However, it should be noted that although the author was careful to keep syllables constant, stress and rhyme are not mentioned. If stress and rhyme were kept constant, the method of creating lyrics would have been more likely to produce lyrics that did not create unequal expectation effects.

Participants (N = 137 participants, 111 female and 26 male undergraduates, many of whom received course credit for participation) were randomly assigned to the six conditions. Pretest and posttest mood and arousal measurements were taken using a 9-point self-report scale. Dependent variables related to the lyrics were measured on a 7-point scale that asked the following questions: 1. How well do the lyrics go with the music? (to make sure participants were paying attention), or for the no music group, how likely would these lyrics be to be set to music? 2. How much do you like the lyrics? 3. How well do you relate to the lyrics? 4. A cued word completion task was also administererd to test for recall of the lyrics. The participants in the no music conditions were given the lyrics and asked to read the words while imagining a melody that might go with the words (this is stated in the abstract, though it is not discussed in the procedure section). Findings revealed that mood influence resulted from music, but not lyrics. This

finding (which is contradictory to the findings in Stratton and Zalanowski, 1994) could possibly be an artifact of the study design, because the music and lyrics derived in Sousou's study came from incompatible genres (classical music, popular song lyrics, and folk song lyrics). The presentation of the song lyrics was also low in ecological and internal validity in other ways: Though the author suggests that singing lyrics could improve the study design, the presentation of lyrics in this study was not sung in the no music condition, and sung in the conditions with music. This resulted in awkward materials and in an unequal comparison. The author attributes differences in findings in this study as compared with Stratton and Zalanowski to the possibility that Stratton and Zalanowski's music was more "ambiguous" (though I disagree with that assessment). The materials in Stratton and Zalanowski were higher in ecological validity, and also the study was higher overall in internal validity.

Methodological issues: Direct vs. mediated/moderated effects. Most of the studies reviewed here have examined a direct relationship between popular songs and psychological effects. Only a few studies have looked directly at variables that might mediate or moderate these relationships, though some studies have made logical inferences about the existence of such relationships. For example, Barongan and Hall (1995) sought to discover the impact of misogynistic rap music on aggressive behavior using a two-group comparison design with no control group. The independent variable had two levels: misogynistic or neutral rap music. As with many of the studies reviewed here, "music" is defined by the theme of the lyric. Misogynistic lyrics were defined as those containing frequent references (frequency is not quantified) to sex and violence.

Neutral lyrics were defined as containing no references to sex or violence and were mainly about issues related to African American life and struggles. Participants ($N = 54$, all college men, 6 African American and 2 Asian American, no other ethnicities specified) were randomly assigned to one of the two conditions, then listened to four songs in a row. Between each song, to encourage participants to pay attention to the songs, participants were asked to rate liking of songs on a Likert scale. The dependent variable, aggressive behavior, was measured by each participant's choice of a film clip to show to either a male or female research confederate. Film clips contained neutral, sexual/violent, or assaultive material. A chi-square analysis ruled out the possibility of effects being due to the gender of the research confederate. The possibility of a significant effect due to liking of the music was also ruled out. In the group that listened to the nonmisogynistic rap, 7% of participants chose to show a sexual/violent or assaultive film clip; however, in the group that listened to the misogynist rap, 30% chose a sexual/violent or assaultive film clip. A chi-square analysis confirmed that this difference between the two groups was significant $\chi(l) = 4.42$, ($p < .05$). Therefore, the hypothesis that misogynistic rap lyrics prime aggressive behavior in the laboratory was confirmed. The researchers state that aggressive cognitions mediate this relationship and note that this supports Hall and Hirschman's (1994) finding that cognitive distortions lead to aggressive behavior. However, there was no instrument that measured cognitive distortions given in the experiment; rather, it was assumed that the songs primed these cognitions and that these in turn produced the observed effects. Barongan and Hall's study is well-designed in that it addresses the possibility of alternative explanations due

to music preference or due to the gender of the research confederate; however, other individual differences are not considered. The authors are careful to note the limitations of the study which include the homogenous sample and the lack of a control group. Improvements to the study design could also be achieved by incorporation of a method of control for music (using the same music in each condition) and inclusion of a measure (such as the TAT) of implicit cognition. The researchers did not explain how the songs differed musically – this is important information. Lastly, ethnicity was not addressed in this study even though the majority of participants were apparently Caucasian and the music lyrics in the neutral condition addressed African American issues. An effect for the gender of research confederates was analyzed, but not an effect for ethnicity of research confederates. Considering that the content of the lyrics was characterized with reference to ethnicity, this is important missing data.

A more complete exploration of indirect effects is exemplified by the use of the general learning model (Buckley & Anderson, 2006) as the theoretical basis for Greitemeyer's (2009a, 2009b) experimental studies of the psychological effects of prosocial lyrics. Greitemeyer (2009b) compared the effect of prosocial lyrics to neutral lyrics (as defined by a pilot study, $N = 40$) on prosocial thoughts, affect, and behavior, which he hypothesized would all increase after short-term exposure to the prosocial lyrics in comparison with the neutral lyrics. In three separate experiments that measured each successive dependent variable, participants listened to songs with either prosocial or neutral lyrics prior to being assessed on the dependent variable. Prosocial thoughts were measured using a word completion task. Prosocial affect (empathy) was measured by

recording participants' responses to two essays that detailed stories of characters undergoing episodes of personal suffering (a romantic break-up and an athlete with a broken leg). Prosocial behavior was measured by the willingness to donate money (2 euros) given to the participants by researchers to a charity, as opposed to keeping the money for themselves. Greitemeyer found a significant effect of the prosocial songs on the dependent variables in all of the three experiments. Effect sizes varied across the three experiments: d=0.73 for the t-test in Experiment 1 (a relatively large effect size), η^2=.15 for the repeated measures ANOVA in Experiment 2 (a moderate effect size), and w=.27 (also a moderate effect size) for the χ^2 test in Experiment 3. Greitemeyer chose the songs and then they were tested in a pilot study (N = 40). In order to enhance the ecological validity of the study, which was conducted at a German university, there were two German songs and two English songs, one of each for prosocial and neutral conditions presented in each experiment.

In a follow-up study, Greitemeyer (2009a) found, consistent with the general learning model (Buckley & Anderson, 2006), that the relationship between listening to prosocial songs and helping behavior is mediated by feelings of interpersonal empathy.

Peterson (2004) and Peterson et al. (2008) undertook an ambitious investigation of individual differences in response to suicide-related lyric themes. Participants (N = 126 college students, 70 female and 56 male, 89% Catholic) listened to the same songs with suicide-related lyrics that were used in a previous study (Rustad et al., 2003) and completed a large number of instruments to measure individual differences: the Neuroticism Scale and Openness to Experience Scale (NEO-N and NEO-O; Costa &

McCrae, 1992); the Rosenberg Self Esteem Scale (SES; Rosenberg, 1965); Marlow Crowne Social Desirability Scale (MCSD; Crowne & Marlowe, 1960); and a demographic questionnaire. To measure the dependent variables of mood and cognition, participants completed the Positive and Negative Affect Scale (PANAS; Watson et al., 1988), the TAT (H. Murray & Harvard Psychological Clinic, 1943), and vignette reaction generation forms (VRGF; Rustad, 1999 cited in Peterson et al., 2008). A memory measure for song lyric recall was used that mixed lyrics used in the study with the control lyrics from Rustad et al. to see if participants could correctly recall which lyrics they had heard. Lastly, participants completed the Music Experience Questionnaire (MEQ; Small, Jobes, and Peterson, 2000 cited in Peterson, 2008) to report cognitive and affective reactions to the music. Findings were that personality traits predicted level of suicide-related responses to TAT and VRGF stories. Specifically, lower NEO openness significantly correlated with higher suicide-related responding. Knowing someone who had died by suicide also resulted in higher suicide-related responding and higher negative mood after listening to suicide-related content. No effect was found for knowing someone who had died by suicide on pretest mood, so the effect was attributable to the music. This study, was time-intensive for participants (it took about 90 minutes for participants to complete the procedure) and for researchers but yielded a tremendous amount of data and the method acknowledges the complexity of reactions to music and lyrics according to a wide variety of person variables.

Methodological issues: External validity. Some might argue that improving methodology for the experimental study of the effects of music lyrics is not important

because the external validity of laboratory studies is low. However, one argument for the external validity of experimental studies on the psychological effects of music lyrics is that, according to the general aggression and general learning models (Buckley & Anderson, 2006; Lindsay & Anderson, 2000), accumulated effects of short-term media exposure lead to long-term effects. Another argument is that laboratory studies are not in fact low in external validity. This argument has been tested using meta-analysis to examine variables related to individual differences and response to situational variables, including media violence, in aggression studies (Anderson & Bushman, 1997; Anderson, Lindsay, & Bushman, 1999; Bushman & Anderson, 1998). The authors found that laboratory results were analogous to findings in studies of real-world aggression. Anderson, Lindsay, and Bushman compared more laboratory and field studies (1999) coming to the conclusion that the common notion that lab studies lead to trivial results low in external validity is erroneous.

On the other hand, some studies are extremely limited in their generalizability because samples are drawn from uniquely homogenous participant pools. For instance, Wester et al. (1997) studied the effects of gangsta rap on a sample of men with little previous exposure to the genre. The study (N = 60 undergraduate males) employed a 2 (lyrics or no lyrics) x 2 (music or no music) factorial design, resulting in four groups: (a) sexually violent music and lyrics, (b) the same music without lyrics, (c) the same lyrics without music, and (d) no music or lyrics.

To choose music for the study, researchers selected five recordings from a record store that were labeled as "gangsta rap" and that had sexually violent lyrics. Next, three

self-identified fans of gangsta rap were asked to choose songs from these recordings that were consistent with the genre. Then, a panel of 7 male students from the same participant pool as study participants rated the songs for sexual violence and degradation to women. The songs were confirmed to have sexually violent, misogynistic content. The dependent variables were negative attitudes toward women and adversarial sexual beliefs as measured by three subscales of the Sexual Attitude Survey (SAS; Burt, 1980) and the Attitudes Toward Women Scale (AWS; Spence & Helmreich, 1972). No effects were found for lyrics alone or lyrics with music on the dependent variable of negative attitudes toward women. The participants in the lyric conditions did have significantly greater adversarial sexual beliefs than the no lyric groups. The finding that gangsta rap songs without lyrics did not result in significantly more negative attitudes, contradicts past research (e.g. St. Lawrence & Joyner, 1991). However, the authors hypothesize that because participants in this study were low in previous exposure to gangsta rap, the music itself did not serve as a prime to negative attitudes and beliefs as it would if participants had chronic exposure to that type of music. In addition, participants for this study came from "a small, religious, predominantly White, Midwestern liberal-arts university"(Wester et al., 1997, p. 500), which the authors deliberately chose because of the likelihood that, in the late 1990s, this population would have less exposure to gangsta rap than other college populations that are more secular, diverse, and urban.

Methodological issues: Ethics. If negative psychological consequences are a possible result of exposure to songs with certain lyrical themes, the issue of how to protect participants in such studies is relevant. Many studies reviewed did not report

consideration of ethical issues. Doctoral dissertations do mention obtaining the approval of Institutional Review Boards prior to conducting research. Peterson, Safer, and Jobes (2008) included two ethical safeguards in their procedures: (a) prior to exposing participants to materials, the researchers stated that the materials might be disturbing and advised anyone who was currently distressed not to participate, and (b) as part of the debriefing procedure, participants were given information about how to obtain free services at a local counseling center. Barongan and Hall (1995) informed participants that they would be exposed to materials that were sexual and violent in nature and gave participants the chance to withdraw from the experiment. Sousou (1997) stated prior to the experiment that anyone who might find sad material stressful or uncomfortable should not participate. Sousou also made an attempt to leave participants in a pleasant mood after the experiment by playing the song "Don't Worry, Be Happy" (McFerrin, 1988).

A parallel to the present investigation. Brunner (2006), noting that most of the studies in the literature that examine effects of popular music are really studies of music lyrics (e.g., Anderson et al., 2003; Ballard & Coates, 1995; St. Lawrence & Joyner, 1991), wanted to study the effects of heavy metal music, to make a distinction between the effects of lyrics and those of music, and to control for the effects of lyrics. In this way, Brunner sought to do for studies of heavy metal music what I would like to do for studies of music lyrics. By comparing songs in original and cover versions Brunner devised a method for increasing internal validity. *Covers* are songs recorded by other than the original artist. The cover versions were arranged in different styles from the original

songs. For example, the song "Anarchy in the U.K." (P. Cook, Jones, Lydon, & Matlock, 1976) originally recorded by the Sex Pistols in a punk style, was compared with the same song arranged in a heavy metal style recorded by the group Megadeth.

The study used a 2 (familiar/not familiar) x 2 (heavy metal/not heavy metal) x 2 (violent/not violent) factorial design. Original songs were not heavy metal songs. Cover songs were heavy metal songs. Participants (N = 102 undergraduates) were randomly assigned to the pop/original or the heavy metal/cover group. Participants were given headphones to listen to the music, which the author notes is consistent with current everyday listening conditions (especially considering the popularity of MP3 players). The assessment instrument used was a researcher-designed questionnaire designed to measure a variety of variables in the pretest and postlistening phase of the experiment. Variables included familiarity, mood, liking, and social judgments.

Findings indicate that

> music itself does have an impact on listening experience and emotional state…heavy metal songs produce higher levels of misinterpretation and higher levels of anger than pop, rock and punk songs…the results show that on a music genre continuum, heavy metal covers performed more musically dissimilar from the originals significantly impacted participants' excitement levels, but not their happiness, sadness, or anger levels. (Brunner, 2006, p. 101)

Brunner (2006) also designed a study, similar to Ballard, Dodson, and Bazzini (1999) to detect style bias -- with the addition of an assessment for familiarity. Brunner found that all of the stimuli were low in familiarity for study participants. Results were consistent with Ballard, Dodson, and Bazzini; however, Brunner found some style bias, which is mainly attributable to a bias against the listeners/fans of certain styles, rather than a bias against the music itself.

Overall, Brunner (2006) concluded that music is the more powerful determinant of any effect found in studies of lyrics. Finding that a direct effects approach is lacking in understanding of the complexity of individuals' responses based on familiarity, attitude, preference, other individual differences, Brunner argued for the development of better methods for studies of music and lyrics. In addition, Brunner calls for an integration of culturally based and experimentally based studies of heavy metal. In reviewing the body of literature related to heavy metal, Brunner notes that

> One final caveat that will be underscored is ignorance displayed by scholars when studying the topic of heavy metal. Across almost all of the academic studies referenced in this literature review, authors (e.g., Walser, 1993; Weinstein, 2000; Purcell, 2003; Anderson, Carnagey, & Eubanks, 2003) have consistently misspelled musicians' names, mislabeled songs or records, and miscategorized bands or fan actions. While not a critique of research design, such mistakes represent poor scholarship and lack of attention to detail. *More importantly, they demonstrate a lack of understanding or ignorance of the complexity of the culture under discussion* [emphasis added]. (Brunner, 2006, p. 40)

Brunner presents a six-page appendix of the errors found in published scholarly articles related to heavy metal (Brunner, 2006, pp. 139-144). Although the author acknowledges that some of the errors may be typographical errors, the errors are striking in that they involve prominent artists and works (as opposed to obscure ones). Misspelling of Ozzy Osbourne's name is one of the most frequent errors made. Osbourne, of course, is by any measure one of the most famous and influential figures in heavy metal – and has been so throughout his career (spanning five decades). Even if scholars are not acquainted with heavy metal culture, the public concern and lawsuits

related to Osbourne's music should at least be familiar to scholars studying the effects of heavy metal music.

I agree that the complexity of the meaning of music and lyrics to fans, and the subcultures represented by music preference groups are generally poorly understood by scholars associated with this body of literature. As this literature review reveals, the skills and knowledge necessary to conduct research in this area are multidisciplinary. Perhaps limitations in this regard are unavoidable; however, these limitations are not acknowledged in published accounts of research on music and lyrics. No accounts are published of attempts to mitigate these limitations (for example, by the use of consultants or multidisciplinary teams of scholars).

In conclusion, the review of experimental studies shows that numerous methodological improvements are needed to increase the validity and reliability of studies of popular music. So far, improvements in internal validity have come at the expense of ecological validity, and vice versa. A method of comparing lyrics unconfounded by the effect of music is one of the most pressing methodological issues to be solved. More studies that examine mediators and moderators of observed effects are needed. Direct effects models are outdated and provide limited data. Although the use of well-researched and validated instruments has ensured that measurement of dependent variables is high in construct validity, methods of defining independent variables are only strong in studies that examine narrowly defined themes (e.g., suicide). Experimental studies provide valuable data that need not be low in external validity; however, the

majority of studies have recruited only participants who are mostly Caucasian, college undergraduates; hence, other populations need to be studied.

Nonexperimental (Survey) Studies of Music Lyrics. A number of frequently cited survey studies have found links between antisocial and self-destructive behavior, other psychosocial problems, and listening to heavy metal music (Arnett, 1992; Wass, 1991; Wass, Miller, & Stevenson, 1989; Wass et al., 1988). Yet, Recours (2009) surveyed 333 metal fans and found that heavy metal fanship is not associated with mental health problems (specifically, anxiety and depression) in France. Although these studies provide important data for the literature, they suffer (like all survey studies) from a number of inherent limitations; in particular, because they are generally correlational in nature, they cannot make claims of causal inference. Survey studies rely heavily on random sampling as a basis for making claims of generalizability, but frequently it is not practical or possible to randomly sample a population and still obtain a large enough sample size; therefore, convenience samples are often used. Survey studies are also susceptible to social desirability bias and measurement bias (especially when closed-ended questions are used). Although survey studies related to music lyrics are no exception to these problems, they do shed light on methodological issues that need to be considered in the design of experimental studies – especially in terms of highlighting possible covariates to include in comparison studies (such as gender, ethnicity, and so on). Survey studies are organized here based on category of issues relevant to experimental methodology.

Use of structured content analysis to define themes. Primack, Douglas, Fine, and Dalton (2009) hypothesized that there is a relationship between exposure to sexually degrading music lyrics and early sexual activity among urban socio-economically disadvantaged adolescents. This study is distinctive because of the use of a structured content analysis method used to categorize the thematic content of lyrics themes in songs by participants' favorite artists (Primack, Gold, & Schwarz, 2008). All coding procedures were explicitly described in a codebook.

Participants (N = 711 ninth grade students) were surveyed about their favorite musical artists, listening habits, and sexual experience. The most popular songs for each artist were analyzed for degrading and nondegrading sexual content (as per Primack et al., 2008). A percentage score for degrading sexual content was determined for each artist. An exposure score for each student was then computed based on the number of listening hours per day times the percentage score for their favorite artist (or second or third choice of artist in the case where the participant's favorite artist had not appeared in the top 535 songs in *Billboard* for 2006-2007). The exposure scores were then divided into tertiles and grouped as low, medium, or high exposure. Logistic regression was used to analyze the relationship between exposure to degrading lyrics and intercourse (yes/no). Ordered logistic regression was used to analyze the relationship between exposure to degrading lyrics and an ordinal noncoital sexual continuum.

Results confirmed the researcher's hypothesis that there is an association between exposure to sexually degrading lyrics and early sexual behavior. The participants reported being exposed to a mean number of 14.7 hours per week of sexually degrading lyrics.

Those participants with the most exposure to sexually degrading lyrics were twice as likely to have had sex than those who had the least exposure (OR=2.07; 95% CI [1.26, 3.41]), and among those who had not had sexual intercourse, those who had the most exposure to sexually degrading lyrics were nearly twice as likely to have progressed further along the noncoital continuum than their peers with the least exposure (OR=1.88; 95% CI [1.23, 2.88]). There was no significant relationship between nondegrading sexual lyrics and sexual activity.

Pardun, L'Engle, and Brown (2005) investigated whether there is an association between a media diet heavy in sexual content and middle school students' current sexual activity or intentions for future sexual activity. Participants (N = 1,074 in the final sample; mean age 13.7 years) completed a survey regarding their media habits, including whether or not they listened to specific musical artists. Later, participants completed an in-home computerized questionnaire about health and sexuality. The survey helped the researchers identify specific media content to analyze, and also provided the data that formed the basis of the Sexual Media Diet (SMD) score for each individual participant. The researchers used structured content analysis to detect sexual themes in the media, including music lyrics, that participants reported consuming. The content analysis procedure is detailed in Pardun et al. (2005). A codebook was used and extensive training of a dozen coders, lasting 6 weeks, was conducted. Eventually, inter-rater reliability for general coding of sexual content in music lyrics was high (Scott's pi = .76) and moderately good for coding of more detailed characteristics of the sexual content in music lyrics (Scott's pi = .64). The lyrics in the sample (N = 67) had a higher proportion

of sexual content (40%) than any other media in the study. Once the content analysis was completed the SMD was derived for each participant and regression analyses were performed on the data. While the authors report an association between the dependent variables (heavy sexual activity, light sexual activity, and intention to engage in sexual intercourse) and a high level of sexual content in all types of media combined, the specific association between sexual content in music lyrics and the dependent variables, though significant, reveals detection of only a small amount of variance explained: for light sexual activity, $\beta = 0.139$, $R^2 = 0.014$, $p < .001$; for heavy sexual activity, $\beta = 0.090$, $R^2 = 0.006$, $p < .001$; and for intentions to have sexual intercourse, $\beta = 0.147$, $R^2 = 0.015$, $p < .001$. J. Brown et al. (2006) conducted further analysis of the data from the Pardun et al. (2005) study, which included additional data collected from the same participants at a later time point; however, the report of the longitudinal data did not break down results by type of media.

Suicidal ideation/attitudes and music lyrics. Suicidal ideation, attitudes toward suicide, suicidal behavior, and related mental health problems (such as depression) are themes that are much more concrete than the fuzzier and more relative concept of "violence" that is more prevalent in the literature on psychological effects of music lyrics. Suicide-related constructs, being more concretely related to death and self-destruction, lend themselves to survey studies that have superior construct validity. As previously discussed, the issue of whether music lyrics can influence suicidal ideation or behavior is of great public concern, so more research on this topic is needed of both qualitative and quantitative design.

Burge, Goldblat, and Lester (2002) found that although music preference may predict suicidal ideation, it does so in different ways for males and females. In addition, by means of a factor analysis, the authors discovered that certain musical preferences tend to cluster together; therefore, to study the link between music preference and suicide it is inadvisable to isolate preference for one type of music alone as a factor linked to correlates of suicides.

Stack, Gundlach, and Reeves (1994) acknowledged that heavy metal music is part of a subculture, and studied the link between heavy metal and suicide in this context. They found that a higher degree of involvement in the heavy metal subculture is linked with more suicide risk. In a later study, Stack (1998) found a positive correlation between acceptability of suicide and a preference for heavy metal. In a study of adolescents (Scheel & Westefeld, 1999), it was also noted that a preference for heavy metal may indicate a risk factor for suicidal ideation and behavior, but this seems more likely to be a function of individual psychosocial factors that lead to this preference than to be directly linked to the music itself. Similarly, Lacourse, Claes, and Villeneuve (2001) found that heavy metal music preference is not related to suicide risk when controlling for other factors (family relationships, alienation, general suicide risk, and drug use).

Stack and Gundlach (1992) found a positive correlation between the amount of country music radio airplay in a given geographic area and suicide rates. The publication of these results led to numerous follow-up publications. Maguire and Snipes (1994) tested the reliability of Stack and Gundlach (1992) but could not replicate the results. After Stack and Gundlach (1994) criticized the Maguire and Snipes study on the basis of

the data employed in the replication, Snipes and Maguire (1995) attempted another replication of the original study using Stack and Gundlach's data on suicide rates; however, they still found nonsignificant results. In response, Stack and Gundlach (1995) published yet another article in response to Snipes and Maguire, this time presenting additional evidence of their own to bolster the original argument and findings. Later, in an experimental study, Lester and Whipple (1996) also found results contradictory to Stack and Gundlach. Other authors (Mauk, Taylor, White, & Allen, 1994) challenged Stack and Gundlach's findings on the basis of identifying several threats to the validity of the original study.

Stack (2000) has also studied suicide acceptability in blues fans, finding an indirect effect of a preference for blues that is mediated by lowered religiosity (a major predictor of suicide acceptance according to Neeleman, Wessely, & Lewis, 1998). Opera fans' acceptability of suicide as a remedy for family dishonor was also studied by Stack (2002) and results indicated that opera fans are more than two times as likely as other types of individuals to have an attitude of acceptance for this type of suicide. Only two factors were more predictive of acceptance of suicide for honor than being an opera fan: (a) lowered religiosity, and (b) level of education.

Lyric comprehension. Young listeners do not always understand the meaning of song lyrics, and lyric comprehension develops as children age (Greenfield et al., 1987). Listeners frequently misinterpret the overall meaning of lyrics and fail to detect sarcasm or other double meanings (Greenfield et al., 1987; Wanamaker & Reznikoff, 1989).

Hansen and Hansen (1991b) studied the cognitive processing of heavy metal songs in a listening condition with lyrics available compared to a listening condition with lyrics unavailable. The dependent variables studied in each of three studies were recall, lyric comprehension, and content recognition. High cognitive load was defined by the lyric being unavailable to the participants; low cognitive load was defined as the lyric being available to participants. In Experiment 1, a free recall of key words was used to measure the dependent variable, as well as a fill-in-the-blank measure assessing recall of lines that represented the lyric theme. In Experiment 2, the same measures were used but with the addition of a comprehension measure. In Experiment 3 participants completed a measure of content recognition. Lyrics were better remembered and understood when the lyrics were provided, but there was no difference between the groups in terms of comprehension of overall themes (which were well-understood).

Regardless of their level of understanding of lyrical messages, adolescents cite lyrical content as the least important reason for liking a song (Gantz, Gartenberg, Pearson, & Schiller, 1978; Rosenbaum & Prinsky,1987). A combination of rhythm, vocals, music, and melody affects music preference, not lyrical content per se (Christenson, 1992; White, 1985).

Lyric comprehension is important to assess as part of any experimental study of popular music. Recent researchers (e.g., Sprankle & End, 2009) have included measures disguised as memory tasks to assess participants' comprehension and familiarity of lyrics presented in experiments.

Individual differences. Individuals respond differently to media for various reasons, including differences in personality traits, culture, gender, and cognitive abilities such as memory and perception (Oliver, 2002). These differences may be a factor not only in the type of reaction, but also the strength of reaction an individual has to a given media exposure. Research should have a theoretical basis for examining individual differences in any given context; for example, Oliver points out that the use of gender as a covariate is frequent, and often automatically used in media effects research without being theoretically justified for inclusion in a given study.

Gender. Anderson et al. (2003) used gender as a factor in their study of lyric effects and found no interactions with the other factors. They therefore analyzed gender as a covariate. When doing so, they did find that increases in aggressive cognition subsequent to listening to songs with violent lyrics were more pronounced for men than for women.

Iverson, Reed, and Revlin (1989) found that, in general, males and females rate the personal relevance of song lyrics equally, but that there is a significant difference in how they rate their relevance if the lyrics are presented differently (i.e., spoken or sung). Therefore, if spoken lyrics are used in a control condition, gender should be included as a covariate in the study design.

Ali and Peynircioglu (2006) found that, although there is no difference for men, when music is presented without lyrics women rate the emotion associated with the music as more intense as compared with the same music with lyrics.

Ethnicity and culture. There are differences in the ways that individuals of different ethnicities perceive music associated with a particular racial or ethnic group (Zapatel & Garcia-Lopez, 2004), making ethnicity an important variable to consider in studies of music with or without lyrics.

It must be noted that the role of culture in the relationship between music lyrics and psychology has barely been studied and there is much need for cross-cultural research. Murray and Murray (1996) published a cross-cultural study of lyrics in advertising in the United States and the Dominican Republic pointing out that

> An inherent but infrequently stated assumption of studies on the "effects" of music in advertising is that such "effects" are universal and thus occur equally across time, situations, and individuals. A second implicit assumption is that the effects of music can be studied adequately in isolation from other elements of commercials such as lyrics and video. That somewhat reductionist perspective is at odds with the rich literature on music from such music theorists as Iser (1978) and Meyer (1956, 1967) and from consumer behavior theorists such as Scott (1990), who argue that music, like language, has the potential to invoke complex, culture-dependent symbolic schemata. (p. 51)

In addition to making the case for considering culture in studies of music lyrics, these comments support my contention that making meaning out of song lyrics, in such a way as to provide for the validity of experimental studies, is a complex, multilayered process that demands more consideration than simple pilot studies or researcher opinion can provide.

Personality. Media effects have been found to be mediated and moderated by numerous variables, including personality traits; therefore, traits are an important consideration in the design of studies of music with lyrics.

Gentile, Lynch, Linder, and Walsh (2004) found that hostile personality traits mediate the relationship between violent video game exposure and behavioral outcomes (arguments with teachers, school grades, and physical fights). Finn and Korukonda (2004) found that the personality traits agreeableness and conscientiousness are important mediators in the relationship between computer use and an individual's likelihood to have positive feelings about using computers. Bushman and Geen (1990) found that personality traits moderate emotional and cognitive responses to violent videos.

More specifically, in regard to music, Hansen and Hansen (1991a) looked at individual differences among fans of different types of music. Using a survey design employing a researcher created self-report personality and survey measures, the study looks at personality attributes (only three: Machiavellianism, machismo, and need for cognition and perceptions of social reality) to see if there are differences on personality attributes between groups of punk or heavy metal fans. Other music fans were not excluded from the study, but the analysis was done only on the data gathered from fans of punk and heavy metal. The participants ($N = 96$; 30 male and 66 female undergraduates aged 18 to 25) were also asked about the incidence of certain behaviors among their peers to see if there were differences in these behaviors. Significant differences were found between the preference groups. Notably, the heavy metal fans scored higher on Machiavellianism and machismo and lower on need for cognition and perception of social reality than the punk fans. This 1991 study defined heavy metal as being exemplified by groups such as KISS or Anthrax – this definition is quite different from

what is defined as heavy metal in later studies -- heavy metal has evolved quite a bit since that time.

Personality traits according to the five-factor model of personality (McCrae & Costa, 1987) have been linked to emotional response to music (Rawlings & Leow, 2008) as well as to music preference (Rawlings & Ciancarelli, 1997; Rawlings, Hodge, Sherr, & Dempsey, 1995). Schwartz and Fouts (2003) also found a link between music preference and adolescent personality and developmental issues as measured by the Millon Adolescent Personality Inventory (MAPI; Millon, Green, & Meagher, 1982).

As previously mentioned, personality variables moderate the relationship between rock music with suicide-related content and responses on projective tests (Peterson, 2004; Peterson et al., 2008).

Cohen (2004) observed that adolescent males with a more aggressive personality style generated more aggressive narratives after listening to violent lyrics than a comparison group with less aggressive personality traits.

Music preference. Preference for various styles of music moderates the response to lyrics and music on dependent variables related to emotion (Ali, 2004; Ali & Peynircioglu, 2006). Gowensmith and Bloom (1997) found that the relationship between listening to heavy metal music and state anger level is mediated by music preference. Although heavy metal music aroused participants in their study regardless of preference, increases in anger levels were due to an interaction of heavy metal music and the listener's musical preference. In comparison to heavy metal fans, non-heavy-metal fans had significant increases in state anger after listening to heavy metal.

Although Lester and Whipple (1996) found an association between past suicidal ideation and a preference for heavy metal, the association became nonsignificant when other individual differences were controlled for.

Repetition increases preference for a particular piece of music. A single listening session can result in this effect (Ali, 2004; Peretz, Gaudreau, & Bonnel, 1998). Importantly, St. Lawrence and Joyner (1991) speculate that, due to preference effects, participants' lack of familiarity with a particular style of music may create confounds when measuring the effects of music with lyrics.

Zehr (2005) hypothesized that, if there is a link between preference and personality (as found in Hansen & Hansen, 1991a; Lester & Whipple, 1996), it would follow that there is a link between musical preference and aggression. Zehr was unsuccessful in supporting this hypothesis.

Finally, individual differences impact word association responses (Stacy, Leigh, & Weingardt, 1997) to words related to behaviors. This is important to consider in terms of how individuals may differ in their response to the words of a song.

Music production: the forgotten variable. Popular song production is a complex process that utilizes high tech devices to provide an endless variety of options for recording and manipulation of sound. Every choice made by a music producer that differs from that of the producer of another song used in a comparison study adds an element that compromises internal validity of that study.

The production process begins with composition and lyric writing and ends with *mastering* (a technical finishing process) of the final product. Preproduction decisions

include choices about arrangement, instrumentation, studio location, and equipment. The acoustic properties of recording environments, instruments, and microphones vary widely. During production, recording instruments and vocals (called *tracking*) also involves choosing and applying various electronic signal processing equipment to instruments and vocals. During *mixing* (combining instruments recorded separately into a single stereo recording) further electronic signal processing and effects are applied to create the desired end product. Other, more subtle, changes are achieved in the final mastering process.

Production variables have only been acknowledged or addressed by a very small minority of researchers addressing the topic at hand (notably, Ali & Peynircioglu, 2006).

Content analysis of music lyrics. The literature on quantitative content analysis of music lyrics is very small; however, the majority of the studies are of high quality – in particular, most of the authors of the following studies are extremely careful to explain their methods in detail. This body of literature is especially relevant to this study because it provides clues about how to potentially define, quantify, and/or categorize lyrics in experimental studies.

Use of the Linguistic Inquiry Word Count program. The Linguistic Inquiry Word Count program (LIWC; Pennebaker, Booth, & Francis, 2007; Pennebaker, Francis, & Booth, 2001) categorizes and counts words to produce a proportion of words in any given text that fall into each of 72 categories that LIWC analyzes. LIWC was developed "to provide an efficient method for studying the various emotional, cognitive, structural, and process components present in individuals' verbal and written speech samples" (Stirman

& Pennebaker, 2001, p. 517) for the purpose of discovering whether written expression of emotion could be correlated with changes in behavior (Pennebaker & Francis, 1996). Pennebaker et al. (2003) have linked patterns of word usage with personality, social, situational, and psychological variables. LIWC fits into the category of content analysis software called *word pattern analyzers* and is more frequently used to analyze music lyrics than any other computerized content analysis method.

In an important precursor to studies analyzing music lyrics using LIWC, Stirman and Pennebaker (2001) used LIWC to compare poems by suicidal ($N = 9$) and nonsuicidal ($N = 9$) poets. The authors found that suicidal poets used more self-referential words and fewer pertaining to the collective. Predictions and choice of word categories were based on social integration or disengagement theory (Durkheim, 1966) and hopelessness theory (A. T. Beck, 1979; Petrie & Brook, 1992). For instance, on the basis of disengagement theory, the researchers hypothesized that self-referential rather than collectivist words would dominate the work of suicidal poets. The findings indicate that suicidal poets focus on the self more frequently than nonsuicidal poets, thus raising the possibility that text can provide indicators of suicidality.

Lightman, McCarthy, Duffy, and McNamara (2007) carried out a similar study to Stirman and Pennebaker (2001) with the goal of examining differences between lyrics written by suicidal and nonsuicidal songwriters. They used two software programs to accomplish their goals: LIWC (Pennebaker et al., 2001) and Coh-Metrix (Graesser, McNamara, Louwerse, & Cai, 2004 originally developed this as a tool for reading

comprehension research). The use of the two computer programs allowed for analysis of composition style and content on numerous dimensions.

In the Lightman et al.(2007) study the choice of dimensions to analyze was made based on the previous work of Stirman and Pennebaker (2001), literature about psychological health and language (e.g., J. F. McDermott & Porter, 1989), and literature about suicide (e.g., Bucci & Freedman, 1981). For example, Bucci and Freedman (1981) found an association between a high frequency usage of first person pronouns and low usage of other pronouns in speech samples of depressed individuals. Coh-Metrix analyzed text for this and other compositional differences that reflect ways that individuals who commit suicide differ from nonsuicidal individuals. Differences were identified and scored in themes such as self/other orientation, perception of time, and positive/negative emotions in the lyrics. An independent pairs t-test compared mean scores on each dimension (because this type of data is unlikely to be normally distributed or generalizable to any population, perhaps a nonparametric test of association might have been a better choice of statistical method for this data). The groups compared were suicidal and nonsuicidal songwriters. To control for differences not related to suicidality, each of the suicidal songwriters ($N = 8$) was matched to a nonsuicidal songwriter ($N = 8$) similar in terms of age, nationality, musical style, and degree of fame (all songwriters were male). Lightman et al. found differences between the two groups of songwriters; however, the findings were not significant in the hypothesized directions. They found that "suicidal songwriters use words of lower concreteness, fewer words, more future verbs, and fewer death-themed words in their lyrics" (Lightman et al., 2007, p. 1217). These

findings contrast with those of Stirman and Pennebaker (2001). The authors speculate that the inconsistencies in findings could be due to differences in songs and poem composition style. Another possibility is that although commercial considerations rarely underlie poetry composition, song composition strictly for commerce is common. This may contribute to differences in content.

Content analysis has been used by music therapists to examine lyrics written in a variety of clinical settings (Baker et al., 2005; Cordobés, 1997; O'Callaghan, 1996; Robb & Ebberts, 2003). Following in this tradition, Petterson (2008) conducted a comparison of lyrics written by small groups of at-risk adolescents in a residential setting ($N = 15$) and at-risk adolescents living in the community ($N = 15$). In this study LIWC was used to analyze word usage patterns in participant-composed lyrics ($N = 5$ and $N = 4$ group-composed songs for the residential and community-based samples, respectively).

Manually coded content analysis was also used to categorize themes. The unit of analysis for manual coding was each lyric line. Interrater reliability for the hand-coded content analysis was high, with two out of three expert raters (music therapists) agreeing on thematic category for 91% of lyric lines. Capturing themes in lyric lines allowed identification of the maximum number of themes present in the participant-composed lyrics.

Themes and word usage patterns for each group were calculated using a percentage formula (lines or words in each category divided by total number of lines or words). Comparison of percentages was not subjected to further statistical analysis; therefore, conclusions were drawn without statistical precision (the author uses a t-test to

compare data between groups in a separate portion of the study related to participants' analysis of lyrics using interviews, but uses no statistical method in the lyricwriting portion of the study). A preferable approach might be to use a nonparametric test such as the Mann Whitney U to compare the proportions for each group. Regardless, the differences in proportions between the two groups are striking in some respects.

> distinct differences emerged within the thematic content of song lyrics between the at-risk groups. Combined, the thematic categories "regret" and "loss of control or feeling restrained" comprised 28% of lyric lines written by participants from the residential setting, compared to 2.2% of the community group's lyric lines. In contrast, participants from the community setting wrote considerably more lyric lines within the thematic categories of "positive social/peers" [13% vs. 0% for residential group] and "negative experiences" [21.7% vs. 4% for residential group]. Percentage of word usage in song lyrics supported the results found in some thematic categories. "Past tense" word usage was greater [3.99%] for the residential group [vs. 1.06% for the community group], which ran parallel to the high frequency of this group's lyric lines in the "regret" thematic category [10% vs. 0% for community group]. Percentage of word usage in the "social processes" category was greater for the community group [13.49% vs. 9.48 in the residential group], similar to the higher frequency of this group's lyric lines in the "social/peers" thematic category [13% positive and 6.5% negative vs. 0% positive and 4% negative for the residential group] Other thematic categories, including "positive self-image" and "family," appeared frequently in lyric lines of songs written by participants from both groups. (Petterson, 2008, pp. 39-40)

Petterson (2008) gives instructions sufficient to replicate the study; LIWC categories and hand-coding procedures are clearly defined. Limitations of the study are noted by the author (i.e., small lyric and participant sample size, difficulty controlling external variables such as noise and other distractions). Although measures were taken to avoid social threats to the study (no assistance was given with lyric writing other than general brainstorming instructions), writing sessions were led by a researcher who provided choices of chords, keys, song form, melody and rhythm; therefore, interference

due to the possibility of researcher expectancies and the psychological effects of the musical elements the researcher introduced may have played a role in participant response.

In two studies, Pettijohn and Sacco (2009a, 2009b) analyzed themes in the number one songs on the *Billboard* charts for the years 1955-2003 to test hypotheses based on the environmental security hypothesis (Pettijohn II & Tesser, 1999). In both studies a measure used in previous research (e.g., Pettijohn II & Tesser, 1999), the General Hard Times Measure (GHTM), was used as an indicator of social and economic climate over time.

In the first study (Pettijohn II & Sacco Jr., 2009b), participant Likert scale ratings were used to test the hypothesis that music that becomes popular during economic and social hard times will be rated as more meaningful and more comforting, and vice versa for music that is popular during less threatening times. A questionnaire asked participants ($N = 49$, ages 17 to 24, 91.7% Caucasian, 79.2% female) to rate on a Likert scale the extent to which songs ($N = 49$ songs, the single top song from each year) were perceived as being real, meaningful, comforting, and romantic. Participants were also asked to rate whether each song was slow. Researchers also collected data on participants' musical interests. Interrater reliability was high ($\alpha > .90$ assumed to be Krippendorff's alpha – the report does not specify). Significant correlations in the predicted directions were found: When social and economic conditions as measured by the GHTM were poor, songs that are longer in duration and rated as being slower, more meaningful, more comforting, and

more romantic were popular. The authors state that the study suggests that societal needs are reflected in the popular music charts.

In the second study (Pettijohn II & Sacco Jr., 2009a), both LIWC and participant ratings were used to test the hypotheses that, consistent with the environmental security hypothesis, (a) lyric themes in more threatening social and economic times would be more meaningful and comforting than those in relatively secure social and economic times, (b) lyrics will contain more expressive content, and (c) consistent with social psychology research (Schacter, 1959; Grieve & Hogg, 1999; Mullin & Hogg, 1999, all cited in Pettijohn II & Sacco Jr., 2009a), people will place greater priority on social activities and interactions – particularly with those individuals they most identify with and value. LIWC categories were chosen to test these hypotheses based on previous research (e.g., Pennebaker, 2004; Slatcher & Pennebaker, 2006) showing how word usage is reflective of writers' psychological health and situation. To measure meaning and expressiveness a simple word count was used because using more words may reflect more complexity and better psychological health (Gortner, Rude, & Pennebaker, 2006). LIWC categories representing the future, financial issues, and leisure activities were also analyzed because the authors believed that in difficult times people will be more focused on the future (hoping better times are ahead) and financial issues when resources are scarce or threatened, and less focused on leisure activities when more immediate survival needs are the priority. To measure themes related to social motivation and affiliation, LIWC categories related to person pronouns, social processes, person references, and sports were used (consistent with Pennebaker et al., 2001). Participants ($N = 54$; 85.5%

Caucasian adults, ages 18 to 65, 63% female) rated songs on a Likert scale for real, meaningful, comforting, and romantic content. Data on listening habits were collected. Interrater reliability for lyric content was high ($\alpha > .95$, again assumed to be Krippendorff's alpha) but no significant correlations were found between the subjective ratings and the GHTM; however, the researchers note that considering the small sample of years, nonsignificant trends were evident. The researchers point out that obtaining the subjective ratings in the years when the songs were actually popular might have yielded more significant results, as would presenting the lyrics with the music they are normally set to. These limitations underscore that the need to consider ecological validity when designing content analysis studies is just as important as it is for experimental studies.

In contrast to the analysis of the participant ratings, the LIWC comparisons with the GHTM yielded significant findings at the $p<.05$ level for the relationships in the predicted directions between GHTM and the LIWC dimensions word count per sentence, future references, references to people (first-, second-, third-person pronouns), and sports. Significant relationships in the predicted directions at the $p<.01$ level were found between GHTM and the LIWC dimensions second-person pronouns and social processes. Other exploratory dimensions that had a significant relationship with the GHTM were exclamation points ($p<.05$) and body state and symptoms ($p<.01$). When times were more stressful lyrics contained more content related to body symptoms and less exclamation points. The predicted relationships between GHTM and the LIWC dimensions leisure activity, financial issues, and total word count were not found to be significant. The

authors note that, in retrospect, using word count per sentence may have been a better selection of dimension to represent meaningfulness than total word count.

Pettijohn and Sacco's (2009a) study is the latest published account of the use of LIWC to study music lyric content in relationship to psychological variables. The study benefits from good use of theoretical and practical literature related to the subject and the authors are careful to note limitations of the study (use of one source for songs, using global measure of social and economic conditions, lack of attention to individual differences, restriction of psychological dimensions investigated). Overall, the LIWC studies reviewed show that music lyrics contain discoverable psychological content. This knowledge can inform the design of methods to provide a scientific basis for measurement of lyric themes in experimental studies of music lyrics.

Use of latent semantic analysis. Petrie et al. (2008) analyzed songs by the Beatles with the goal of tracking changes in the development of their lyrics over time and differences between the songwriters. The researchers analyzed 185 songs: 78 by John Lennon, 67 by Paul McCartney, 25 by George Harrison, and 15 by the Lennon-McCartney collaboration. The analysis excluded songs by Richard Starkey (Ringo Starr) because there were not enough for a sufficient comparison. Songs were analyzed using LIWC (Pennebaker, Booth, & Francis, 2007) and latent semantic analysis (LSA; Foltz, 1996; Landauer, Foltz, & Laham, 1998).

LSA is "a theory and method for extracting and representing the contextual-usage meaning of words by statistical computations applied to a large corpus of text (Landauer and Dumais, 1997)" (Landauer et al., 1998, p. 2). LSA compares text being analyzed

within the context of a *corpus* or *semantic space* (a representative comparison group of linguistically similar material). In this study, the researchers collected songs from the *Billboard* Top 100 (excluding Beatles songs) from the years 1962-1972 inclusive. From this collection of songs two semantic spaces (content and linguistic style) were constructed. The content space excluded commonly used words and then used singular value decomposition for factor reduction. The linguistic style space was composed of the commonly used words. Beatles songs were analyzed using LIWC and both the style and content spaces in LSA.

The dimensions chosen to analyze in LIWC were based on previous research

> each of four conceptual linguistic categories: emotional tone, cognitive dynamics, social/identity processes, and time orientation. Twelve of the 18 individual language dimensions associated with these four categories have been used extensively in previous studies (Pennebaker & King, 1999; Pennebaker & Stone, 2003). One additional word count item, sexual words (e.g., sex, breast, love) were added because of its relevance to the current topic. Finally, two of the dimensions, "immediacy" and "making distinctions" are factor-analytically derived from the original Pennebaker and King (1999) work. Texts high in immediacy tend to use short words, present tense, first person singular pronouns, and discrepancy (would, should, could) words. The Making Distinctions category is associated with negations (no, not), exclusive words (except, but), tentative words (perhaps, maybe), discrepancy words, and a low number of inclusive words (and, with). (Petrie et al., 2008, p. 199)

Four questions were addressed in the analysis: 1. How did the lyrics change over time? 2. How did the lyrics compare between composers? 3. How consistent was each composer in content and style? 4. How did the composer's content and style compare?

To examine the data from the LIWC and LSA analyses, various ANOVA comparisons were made. For example, an ANOVA comparison of the LIWC data between three discrete time periods over the course of the Beatles' career revealed

significant effects for change in emotional tone, social identity, cognitive processes, and time orientation. Results were also notable for the finding that the lyrics by the Lennon and McCartney team were more mathematically similar to the lyrics of Lennon than the lyrics of McCartney, suggesting that Lennon may have been the more influential of the two writers in the collaboration. Also notable were findings that McCartney's lyrics showed more variety and complexity than either Lennon's or Harrison's lyrics.

In this study "phrases or choruses that were repeated three times or more within a song were deleted—allowing for only a single repetition" (Petrie et al., 2008, p. 198). The validity of analyzing the songs with repetitive phrases deleted is arguable because on the one hand song choruses and refrains are by definition lyrically repetitive; however, on the other hand, does the repetition add to the meaning of the words or does the repetition overstate their meaning? Deleting the words errs on the side that repetition overstates semantic meaning, but it is not ecologically valid.

At the conclusion of their report the authors discuss the implications of the study beyond the findings related to the Beatles.

> Taken together [the use of word count and LSA], we are entering a new world of language analysis that promises to revolutionize the ways we can use people's words to understand their psychological and social states. (Petrie et al., 2008, p. 202)

Noting the advantage of using an objective and automatic method to index large libraries of music, Logan, Kositsky, and Moreno (2004) addressed the general problem of categorizing songs into similar groups by using LSA to analyze lyrics. They theorized that analyzing lyrics for similarity might yield better overall classification results than analyzing music. Two corpora were used for the study. The first was a general corpus

sampled from articles printed over two and a half years in the *New York Times*. The second corpus was made up of the 399 songs used in the study analysis along with another 41,061 songs for a total of 41,460 songs in the corpus. Words characterized as obscene by the authors were included in the analysis, but obscured in the documented report.

After the songs lyrics were analyzed using LSA, they were compared with an existing analysis of the same songs that had utilized acoustic analysis only, and with another analysis by human raters. The results of these comparisons did not confirm the hypothesis that computerized lyric analysis would come closer to human judgment than computerized musical analysis. In this study the researchers concluded that using a combination of both human and computerized analysis would yield the best results.

Use of other computerized content analysis methods. The Dictionary of Affect in Language (DAL; C. Whissell, 1984, 1994, 1998) is a method for measuring emotion and imagery in text. It has been used to analyze a wide variety of text from baby and pet names (C. Whissell, 2006b, 2006c) to books of the New Testament (C. Whissell, 2006a) to advertising (Rovinelli & Whissell, 1998; C. Whissell & McCall, 1997). Numerous published reports document the validity and reliability of the DAL (C. Whissell, 1984; C. Whissell & Charuk, 1985; C. M. Whissell & Berezowski, 1986; C. M. Whissell & Dewson, 1986; C. M. Whissell, Fournier, Pelland, Weir et al., 1986). The DAL works by scoring text on the basis of three dimensions: pleasantness, activation, and imagery. Text analysis occurs at the level of each word.

Using the DAL, Whissell (1996) analyzed the lyrics of the Beatles between 1962 and 1970 for stylistic and emotional differences between the composers Lennon and McCartney and for differences over time for each composer. After DAL analysis, Whissell used nonparametric statistical tests (Pearson chi-square and Kruskal-Wallis tests of medians) to analyze the resulting data. Trends were analyzed using a Mantel-Haenzel test for linear association. The methods of data analysis used by the author of this study are superior to those used by other scholars using content analysis to study music lyrics because they take into account the lack of normality in the data distributions. Some findings were that Lennon's lyrics were sadder and less pleasant than McCartney's, that McCartney's lyrics became sadder and less pleasant over time, and the Lennon-McCartney lyrics became sadder, less pleasant, and less active over time. These results were consistent with the conclusions of past scholars' critical analysis of the Beatles (Compton, 1988; Schaffner, 1977; Norman, 1981; Davies, 1978; Campbell & Murphy, 1980 all cited in Whissell, 1996).

Whissell (2008) also analyzed the lyrics of Bob Dylan using DAL. Dylan lyrics were grouped into blocks of 22 based on the year of their publication. There were 402 songs analyzed, representing a corpus of 111,000 words. The 22 blocks were compared using multivariate analysis of variance. There was a significant effect for block, as well as significant effects for pleasantness, activation, and imagery; however, effect sizes were very small (the largest was η^2=.002). A significant effect was also found for comparisons between lyrics that were critically acclaimed and those that were not in terms of activation and concreteness (imagery). Again, effect sizes were small but the results

indicate that Dylan received more acclaim for lyrics high in activity and low in imagery. Comparisons between songs were also conducted; these revealed songs that were exceptions to trends occurring in given blocks. Further analyses divided all the blocks into three stages of Dylan's career and examined the use of pronouns using chi-square analyses finding differences consistent with other differences in Dylan's career stages.

> data led to the inference that the "acclaimed Dylan" wrote lyrics which were more Active and more Concrete, while the "criticized Dylan" wrote lyrics which were more Passive and more Abstract. As well, the production of more Abstract lyrics seems to have been Dylan's response to crisis, and the writing of more Passive ones his response to fatigue (both physical and psychological). The three Dylans (rhetor, poet, sage) who coincide with three cycles in the composer's popularity are differentiated not only in terms of emotionality or imagery, but also in terms of the use of first and second person pronouns. (C. Whissell, 2008, p. 483)

Text mining software is another useful tool for analyzing music lyrics. Similar to data mining software, which analyzes structured data (usually stored in a database), text mining software is useful for analyzing unstructured or semistructured data like music lyrics. According to Nasukawa and Nagano (2001), the text mining process boils down to three procedures: (a) extraction of concepts, (b) discovery of rules and patterns, and (c) production of a visual display of results that allows for user interactivity. The goal of text mining is to predict, on the basis of patterns discovered in the process of analysis, "some generalized rules that can be used to predict and evaluate something [researchers] care about" (Yang, Lai, & Hsieh, 2007, p. 5). PASW Text Analytics for Surveys and SAS Text Miner are examples of this type of software.

To study the lyrics of popular Chinese songs, Yang, Lai, and Hsieh (2007) used a multistep method to quantify lyric content. Employing objective measures (text mining software and cluster analysis) and subjective measures (expert ratings) the objective of

the study was to determine if a method of discerning lyrical patterns that predict the popularity of songs could be found. Yang, Lai, and Hsieh hoped to subsequently use their findings to develop an "automatic lyrics generator." After the text mining software (Chinese Word Segmentation System; Chinese Knowledge and Information Processing, 2005), cluster analysis, and expert ratings were complete, the results were weighted. Although the published findings do not make it clear exactly how the ratings were weighted, the researchers do note that they attributed more importance to expert ratings than the computerized pattern analysis. The authors are clear that the generalizability of the study is limited because of the use of Chinese songs and text mining software specifically used to analyze Chinese text; however, the methodology is interesting because of the multimodal approach and concerted effort to quantify lyric content.

Todd (2001) conducted a content analysis of Satanic and Christian-themed music lyrics using a computerized content analysis coding system that was developed for the purpose of analyzing psychotherapy sessions: the Feelings, Thought, Contract (FTC) computerized coding system (Canfield, 1991, 1994; Canfield, Walker, & Brown, 1991). The system utilizes a dictionary of 25,000 words and codes utterances, which are "similar to sentences" (Todd, 2001, p. 81) on 11 dimensions (Emotion, Cognition, Contract, Performance, Negotiation, Person, Reward Value, Psychosocial Setting, Total Number of Utterances, Hit, and Utterance Number). Citing research on persuasion (e.g., Zimbardo & Andersen, 1993) Todd theorized that, because words alone are potent persuaders that can lead to various behaviors, music lyrics can also persuade individuals to act; therefore,

Todd sought to discover what action messages are contained in Satanic and Christian-themed lyrics.

Lyrics analyzed were those of two musical groups representative of each genre: Stryper (Christian heavy metal) and Acheron (Satanic heavy metal). Todd coded the lyrics ($N = 38$ Christian themed songs and $N = 39$ Satanic themed songs) on five of these dimensions (Emotion, Cognition, Contract, Performance, and Reward Value) which produced a positive or negative valence scale rating of -8 to +8 for each utterance. T-tests were used to analyze the resulting data. The principal significant findings (all at the $p<.00$ level) as summarized by the author are,

> Satanic lyrics asked people to perform more negative acts with the Rewards being more negative, as well as containing more negative Emotion and Contract words than Christian lyrics …since previous studies showed how much words influence people, it was concluded that Satanic music would have a more negative effect than would Christian music. (Todd, 2001, p. v.)

This conclusion seems unwarranted in light of the fact that the author only chose to use the lyrics of two musical groups (selection bias). Perhaps a better study design would have been a comparison of case studies. Also, as t-tests are designed to compare groups that are normally distributed, a nonparametric test of association may have been more appropriate in comparing the two groups.

An examination of Todd's (2001) study is instructive in that it points out several other pitfalls to be aware of in designing a lyric comparison study using content analysis. First, the choice of content analysis system seems to have been one of convenience (the author of the TFC is Todd's dissertation chair) rather than one of thoughtful consideration. There is little discussion by Todd of the reliability or validity of TFC for

analyzing song lyrics. Todd's understanding of content analysis methods seems limited. For example, she cites the sociologist Weinstein (2000) as a source, stating that Weinstein "analyzed" 4,000 heavy metal songs (Todd, 2001, p. 30); however, Weinstein's analysis was limited to listening to and categorizing songs based only on her sole subjective judgment (she found two main themes in heavy metal music: Dionysian and chaos). Todd's dissertation does not mention other content analysis methods. Also, Todd does not discuss limitations of the study. Generalizability of the study is limited because the content analysis was restricted to lyrics by two representative musical groups chosen on the basis of the researcher's judgment alone.

There is not enough explanation of the method for the study to be replicable. For example, the author states that "For reasons of discretion, not all of the songs on the albums were used" (Todd, 2001, p. 76). There is no explanation of exclusionary criteria for songs. The possibility of researcher bias in the selection of songs (perhaps the researcher was offended by the lyrics) is possible. There are also inconsistencies in reporting of the statistics for sentences and utterances (i.e., "For the Stryper lyrics, a total of 651 sentences were counted using Corel Word Perfect 8.0, and a total of 602 sentences were counted for the Acheron lyrics" (p. 75). This is inconsistent with the number of "utterances" which Todd says are "similar to sentences": "There were 680 Acheron utterances and 746 Stryper utterances coded" (Todd, 2001, p. 83). Given the definitions stated by the author, this does not account for or explain the difference in the count.

Use of manual coding methods.

A wide variety of manual coding methods have been used by researchers to analyze music lyric content in qualitative studies. In such studies, the personal judgment of a small group of researchers is typically used to code lyric content into categories, although sometimes a structured coding procedure is followed. These manual coding procedures echo the types of procedures used to categorize thematic content in experimental studies; as examples, a few such studies are discussed below and it is noted how lessons from these studies might be incorporated into a plan for improving experimental methodology.

Cole (1971) analyzed popular songs of the 1960s ($N = 100$; top ten songs according to *Billboard* magazine). Songs were manually coded by two coders for mood (happy, unhappy, or balanced) and for thematic content in four areas: love-sex, religion, violence, and social protest. The author gives the information that Gerson's typology of violence (1968 cited in Cole, 1971) is used in the content analysis. The information is also given that the topic area "love-sex" was analyzed for five dimensions: "the relationship, determination of the relationship, dominant participant, predominant type of love, and attitude toward romantic love and physical love" (Cole, 1971, p. 391) and a clear definition of the meaning of social protest is also given. Religion was simply coded for number of references. Results of the content analysis revealed that most popular songs of the '60s contained lyrical content related to love-sex. Although this may seem unremarkable, the author's research is historically important because previous content analyses of popular music (e.g., Carey, 1969; Horton, 1957) focused exclusively on themes related to romantic love; therefore, this appears to be the first time that popular

songs were content analyzed for violent and other themes. The use of a specific typology to describe the meaning of "violence" seems well-advised as a method to improve construct validity in experimental studies.

When content analysis is narrowly focused on a particular topic it may be easier for manual coders to agree on the meaning of lyrics. As previously discussed, narrow topics (such as suicide) that are easily defined may be advisable to study in order to increase the construct validity of experimental studies, and content analyses of such topics may give clues about how to define thematic content. In an investigation of songs with lyrics about the drug MDMA (ecstasy), Diamond, Bermudez, and Schensul (2006) created a clear system for manually coding lyrics as positive, ambiguous, or negative toward ecstasy. They then used grounded theory (Glaser & Strauss, 1967) to examine themes that emerged in the analysis. Although tedious, this method might provide one potential way to define lyric content for experimental studies. The qualitative detail provided using this method would seem to be well worth the effort, especially in preparation for a large and well-funded study. Such a method might be less feasible to use on a more ordinary basis.

Knobloch-Westerwick, Musto, and Shaw (2008) analyzed the top rap/hip-hop and rock songs from 1993-2003 ($N = 260$) to test the common assumption that the lyrical content of these songs contains offensive messages. Two researchers coded the songs for three types of content: number of song lines about impulsive behavior (proactive rebellion), number of song lines about hostile behavior (reactive rebellion), and number of remaining innocuous songlines. Using song lines as the unit of content analysis is a not

common method; however, some authors do not specify the unit of content analysis so it is possible that this method is more common than it appears. Percentage scores for each type of content were obtained for each song. Rebellious messages were found in a majority of the songs, but songs with content related to impulsiveness were more common than those with content related to hostility. Even more prevalent were songs with content related to fun and excitement-seeking. The method used to quantify thematic content in this study seems specified enough to consider as one type of preliminary method for categorizing lyrics by theme for experimental studies (as long as the coding definitions and procedures are clear and precise).

Discourse analysis. The way in which songs "converse" with society is important. Individuals located in various social groups and at various times in history may interpret the meaning of song lyrics differently from those individuals in other places and times. Discourse analysis of popular song can take the form of inquiry into the relational style of the writer vis-à-vis the listener, into societal themes and conversations represented by popular music, or a combination of both. These studies are important to consider for a number of reasons, especially because they provide ideas and background for future research, and they illuminate some of the ways that individuals and groups make meaning out of music lyrics.

Boon (2005) conducted a text analysis of the lyrics of Alanis Morissette's "Ironic" (1995) concluding that the interaction between the reader and the lyrics was the key factor in determining the meaning of the lyric to any given individual. Specifically, Boon concluded that the meaning of the song is *located* in the reader. The importance of

this conclusion – that the meaning of the lyrics is constructed both interactively and intrapersonally – cannot be overstated. Experimental studies that define lyric content using dichotomous categories determined by researchers or in small pilot studies ignore the many layers of meaning in music lyrics that individuals can decode in a multitude of ways.

Cook and Mercer's (2000) discourse analysis of the lyrics of the Beatles concluded that the substantial change in the style of the Beatles' lyrics over time mirrored societal changes that occurred during the course of their career. The authors concluded that the Beatles' ability to reflect society may be what gave them their incredible popularity.

Mangione and Keady (2007) examined existential and relational themes in Bruce Springsteen's lyrics through the lens of psychoanalytic theory. The popularity of Springsteen's music may reflect interest in these themes; however, as previously discussed, the complexity and irony in Springsteen's lyrics may not always be comprehended by listeners.

Armstrong (2001) characterizes rap music as a type of "code" and discusses how subgenres of rap (such as "gangsta rap") represent specialized types of codes that are akin to traits that assist in classification of music for ethnomusicological study.

Binder (1993) conducted a content analysis of media and public discourse during the years 1985-1990 related to the theme that "music is harmful" in relation to the genres of heavy metal and rap. "The 118 opinion pieces were content-analyzed using coding categories constructed by the author…[generating] 68 categories, which were collapsed

to nine frames...[that account for] the total discourse surrounding the issue of harm in lyrics in these publications" (Binder, 1993, p. 757). Significantly, Binder found that differences in the discourse surrounding heavy metal and rap were rife with racial undertones.

Foss (2008) conducted a discourse analysis on 47 theme songs from popular television shows from 1970-2001. Songs were chosen for inclusion in the study if they were from 30-minute, prime-time, television shows that aired for four seasons or more. The goal of the research was to discover if there were any identifiable discourses in the songs and to determine whether ideological change over time was evident in themes within the songs. The author found that, over time, changing themes in the lyrics of the songs reflected changes in societal values. Individual values (independence, empowerment) were stressed in the 1970s, friendship in the 1990s, and traditional values in the 1980s and 2000s.

Hunnicutt and Andrews' (2009) discourse analysis focused on depictions of homicide in rap music finding very specific types of homicide-related content to be prevalent; specifically, glorification/normalization of homicide, warnings about behavior that could lead to violent death (maintaining respect), and the use of words related to murder (e.g., "killing") as slang for success as a rapper. Discourse about homicide in rap music focused almost exclusively on male-on-male violence. This study highlights the importance of cultural and generational differences in understanding the common meaning of words. Lack of knowledge of current slang or meanings encoded in lyrics that will not be understood by groups outside the culture that the music is indigenous to could

impede valid definition of lyric categories by traditional pilot studies or researcher selection.

Theoretical Issues. As discussed in the introduction, the idea that music lyrics exert influence on human behavior, affect, and cognition has a firm theoretical basis. Studies examining the psychological effects of music lyrics are generally guided by either social cognitive theory (Bandura, 1977, 1986) or priming theory (e.g., Ratcliff & McKoon, 1988). Theories incorporating ideas from both, such as the general aggression and general learning models (Buckley & Anderson, 2006; Carnagey & Anderson, 2003) are increasingly the models of choice in these studies because they provide for a more detailed theoretical basis for forming hypotheses.

Theoretical underpinnings of past methodology.

Social cognitive theory. Bandura's (1977, 1986) social cognitive theory is a good theoretical model for understanding the psychology of music with lyrics. According to social cognitive theory, shaping of an individual's thoughts and actions occurs by learning through verbal persuasion, modeling, and vicarious experience.

Bandura (2001) has specifically stated that media are a particularly effective means of conveying social messages and transmitting vicarious experience, and that these translate into learning, and changes in attitudes and behaviors. According to Bandura, "technology both influences, and is influenced by, the nature of social life" (2004, p. 14); therefore, the influence of media is not unidirectional. This idea follows from one of the concepts central to social cognitive theory: *reciprocal determinism.* Reciprocal determinism is composed of three interrelated components: behavior, personal

psychological processes (cognitive and affective processes, mental imagery, and language), and environment. The three components act together in reciprocal fashion to create an individual's personality; therefore, according to social cognitive theory, humans are not passive. This active view of human agency extends to the manner in which we experience media. So, psychologically and behaviorally we interact with media in various ways in concert with the context of a given environment. The manner in which we do so depends in great measure upon our level of *self-efficacy* beliefs.

"People's self-efficacy beliefs determine their level of motivation, as reflected in how much effort they will exert in an endeavor and how long they will persevere in the face of obstacles" (Bandura, 1989, p. 1176). Self-efficacy can be raised or lowered by vicarious experiences, such as those provided by the media. Bandura (2001) has specifically addressed how social cognitive theory applies to mass communications, and how media may raise or lower self-efficacy. As shown in Figure 5 (Bandura, 2001, p. 285) media influence is described as operating along two pathways: direct and socially mediated. The direct route is the path that most media effects researchers have studied. Bandura has stated that it is important for us to do more research on the socially mediated pathway so that we can be more effective in using media to promote prosocial values in culturally appropriate ways (USC Annenberg School for Communication, 2007).

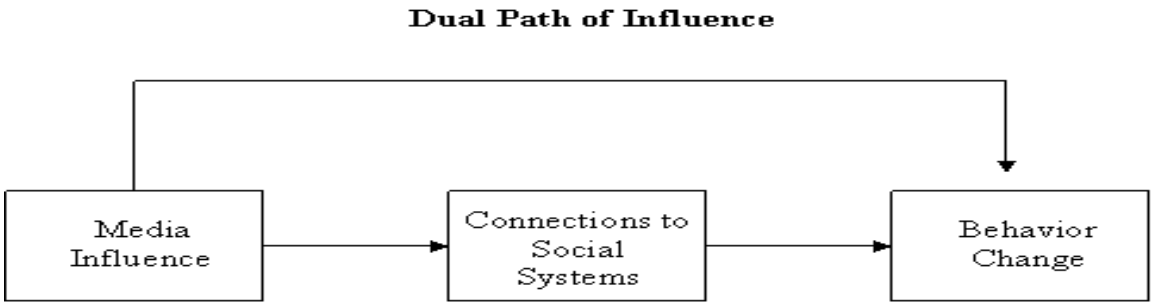


Figure 5. Dual path of communication influences operating on behavior both directly and mediationally through connection to influential social systems. Adapted from "Social Cognitive Theory of Mass Communication," by A. Bandura, 2001, *Media Psychology, 3*, p. 285. Copyright 2001 by Taylor & Francis Informa U.K. Ltd. Reprinted with Permission.

Bandura envisions humans as agents of change working in concert with technology for the betterment of society. In contemplating the electronic era, Bandura has said, "Investments in enabling social aspects of societies are needed to ensure that information technologies and globalization serve as a positive force rather than a divisive one in human lives" (Bandura, 2004, p. 14). He has discussed at length specific ways in which this can and does happen, particularly via entertainment-education media (USC Annenberg School for Communication, 2007). For example, Bandura has discussed how PCI-Media Impact (2007) and the Population Media Center (2003) use media (especially television and radio) specifically for the purpose of educating, modeling, and providing vicarious experience to stimulate social action and increase self-efficacy beliefs. It is possible that music lyrics could be used as a vehicle for positive social change in this way as well.

The general aggression model. One of the criticisms of social cognitive and other learning theories is that they do not consider individual differences. The general aggression model (GAM; Carnagey & Anderson, 2003) provides a more specified theoretical model applicable to media effects. The model has been developed from the earlier general affective aggression model (Anderson, 1997) and combines features of other previous theories into a single framework. The theories that are subsumed under GAM include social cognitive theory (Bandura, 1977, 1986), the cognitive neoassociation model (Berkowitz, 1984), the script model of media violence effects (e.g., Huesmann, 1998), and excitation transfer theory (Zillmann, 1983). The literature on music lyrics (and on media effects in general) focuses on aggression as a dependent variable (aggressive behavior, cognition, and hostile affect) and research has shown the external validity of studying aggression in the laboratory (Anderson & Bushman, 1997; Hall & Hirschman, 1994); therefore, the GAM is a particularly useful theoretical framework to refer to in designing methodology to study music lyrics.

To summarize, GAM postulates that stimuli that increase aggression do so by increasing arousal and aggressive feelings and cognitions (Lindsay & Anderson, 2000). GAM accounts for individual differences in terms of biological, cultural, environmental, situational, psychological, and social dimensions that characterize a given individual's response to a stimulus. GAM also describes the activation of specified psychological and physiological aspects in each domain (affect, cognition, and arousal) in the context of individual differences and situational variables that exist during single or long-term exposure to stimuli that elicit an aggressive response.

As shown in Figure 6 (Anderson, 1997, p. 534), existing individual differences (personality traits, values, beliefs, attitudes, and skills) combine with specific variables in a given situation (e.g., perceptual cues, external and internal physical circumstances, interpersonal relationships) to determine the level and quality of arousal and cognitive and affective response to a particular circumstance. These responses directly impact the way an individual will interpret and react to a situation. According to GAM, this chain of events explains how aggressive behaviors occur. Furthermore, GAM theorizes how perceptual cues delivered via media can increase aggression following both single episode and chronic exposure. Figure 7 (Anderson & Bushman, 2002, p. 34) illustrates how the social input represented by a single media exposure is filtered according to preexisting individual differences and situational specifics to result in cognitive, affective, and arousal responses that lead to situational appraisals which become the basis of both conscious and impulsive aggressive behavior. Figure 8 (Anderson & Bushman, 2002, p. 42) illustrates how multiple or chronic exposure to violent media (e.g., violent video games) increases aggressive content in an individual's beliefs, attitudes, perceptual schemata, expectation schemata, and behavior scripts, as well as leading to overall desensitization to aggression. The foregoing leads to an overall increase in aggressive personality characteristics. The resulting more aggressive personality now becomes the basis of the model as previously described in the single episode model. Hence, after multiple exposures to violent media an individual's response to any single exposure intensifies. Many studies (e.g., Anderson & Bushman, 2001; Anderson et al., 2003) have the general aggression model as their theoretical basis and the model has been used to

describe how aggressive behavior can result from exposure to a wide variety of media formats including aggressive song lyrics (Anderson et al., 2003; Benjamin & Anderson, 2000), violent videos (Bushman, 1998), and pictures of weapons (Anderson, Benjamin, & Bartholow, 1998).

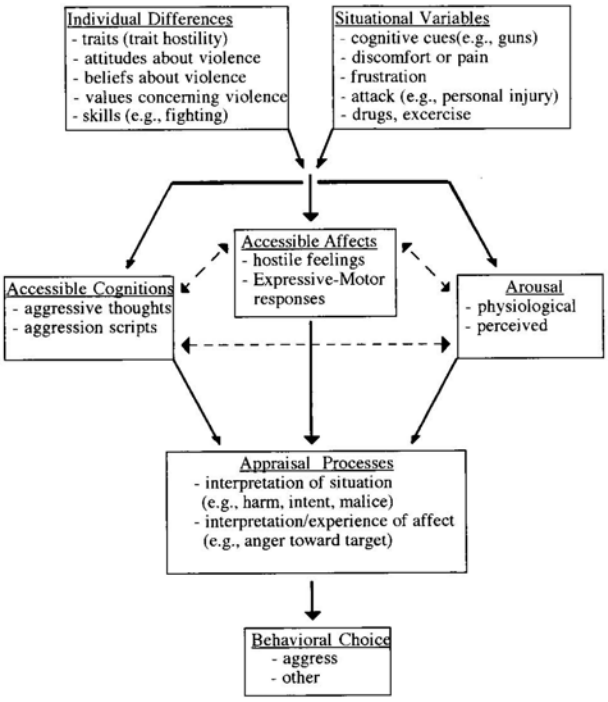


Figure 6. General affective aggression model with selected individual variables. Adapted from "From Antecedent Conditions to Violent Actions: A General Affective Aggression Model," by J.J. Lindsay and C.A. Anderson, 2000, *Personality And Social Psychology Bulletin, 26*, p. 534. Copyright 2000 by Sage Publications. Reprinted with Permission.

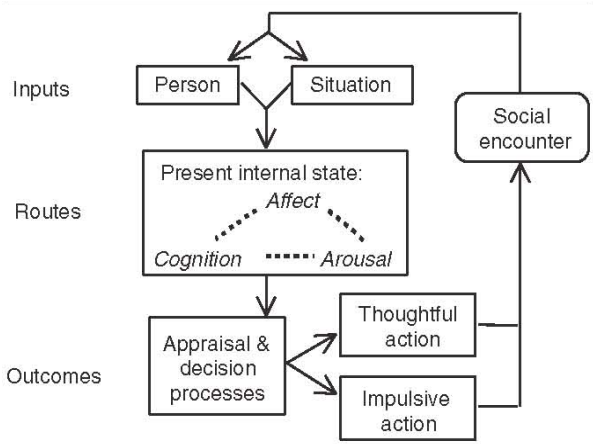
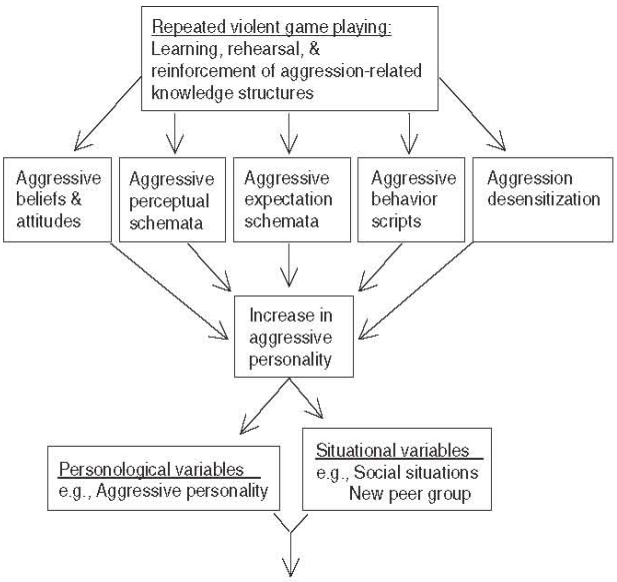


Figure 7. Single episode general aggression model. Adapted from "Human Aggression," by C.A. Anderson and B.J. Bushman, 2002, *Annual Review of Psychology, 53*, p. 34. Copyright 2002 by Annual Reviews, Inc. Reprinted with Permission.



General aggression model as in Figure 6.

Figure 8. Multiple episode general aggression model: Long-term effects of video game violence. Adapted from "Human Aggression," by C.A. Anderson and B.J. Bushman, 2002, *Annual Review of Psychology, 53*, p. 42. Copyright 2002 by Annual Reviews, Inc. Reprinted with Permission.

The general learning model. Buckley and Anderson (2006) have extended the GAM to explain effects other than aggression. The resulting general learning model (GLM) was used as the theoretical basis for Greitemeyer's studies examining the effects of prosocial video games (2009c) and prosocial song lyrics (Greitemeyer, 2009a, 2009b). GLM is similar to GAM, with the exception that it is broadened to include a model that explains any conceivable type of media effect that might result from long- or short-term exposure to any type of media.

As seen in Figure 9 (Buckley & Anderson, 2006, p. 373), GLM explains the effects of media on a given individual as having their genesis in numerous person variables in every biopsychosocial domain. Against this background, as seen in Figure 10 (Buckley & Anderson, 2006, p. 370), the effects of a given instance of exposure to a specific media (or learning) event are situationally dependent, and also dependent upon an individual's internal state at the time of exposure. Figure 11 (Buckley & Anderson, 2006, p. 374) shows a more specified model of GLM that includes an expanded explanation of how an individual makes appraisals of media.

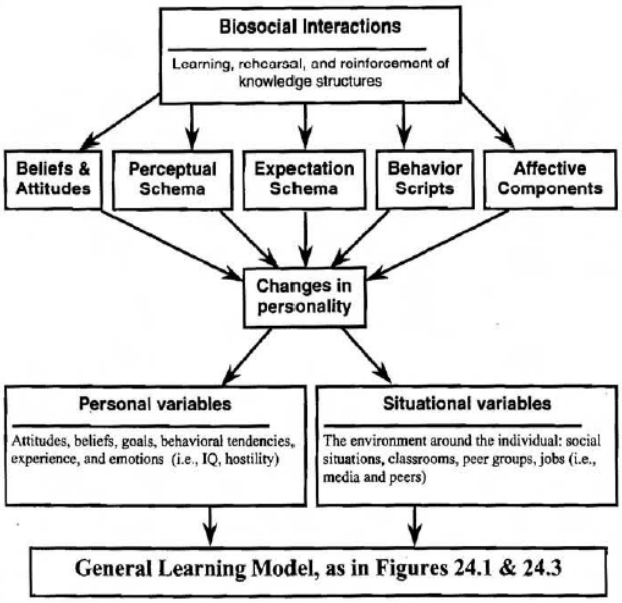


Figure 9. The general learning model: developmental/personality processes. Adapted from "A Theoretical Model of the Effects and Consequences of Playing Video Games," in P. Vorderer & J. Bryant (Eds.) *Playing video games – motives, responses, and consequences* (p. 373) by K.E. Buckley and C.A. Anderson, 2006, Mahwah, NJ: LEA. Copyright 2006 by Taylor & Francis Group LLC. Reprinted with Permission.

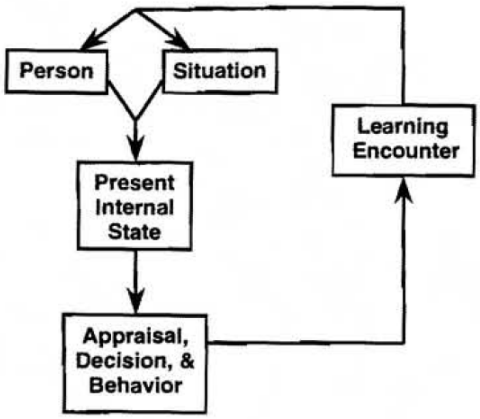


Figure 10. The general learning model: simplified view. Adapted from "A Theoretical Model of the Effects and Consequences of Playing Video Games," in P. Vorderer & J. Bryant (Eds.) *Playing video games – motives, responses, and consequences* (p. 370) by K.E. Buckley and C.A. Anderson, 2006, Mahwah, NJ: LEA. Copyright 2006 by Taylor & Francis Group LLC. Reprinted with Permission.

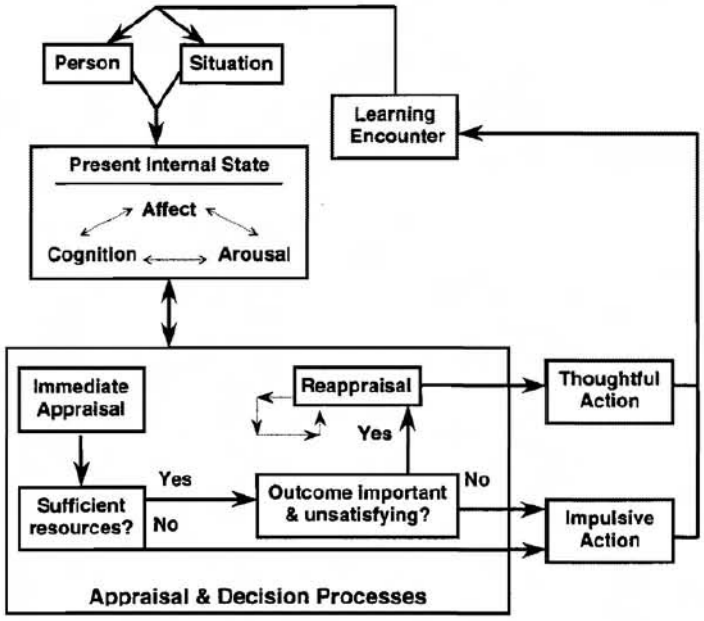


Figure 11. The general learning model: expanded causes and processes. Adapted from "A Theoretical Model of the Effects and Consequences of Playing Video Games," in P. Vorderer & J. Bryant (Eds.) *Playing video games – motives, responses, and consequences* (p. 374) by K.E. Buckley and C.A. Anderson, 2006, Mahwah, NJ: LEA. Copyright 2006 by Taylor & Francis Group LLC. Reprinted with Permission.

Statement of the Problem

In conclusion, music lyrics are a type of communication and should be described and studied with methods and precision similar to other media. Most experimental and quasi-experimental studies reviewed herein used binary categorical descriptions of thematic content in lyrics. Lyrics should be measured on a continuous or at least an ordinal scale in order to capture more nuanced meanings evident in their natural presentation.

Construct validity. There is a need for improvement in operational definitions of lyrics categories (consistent with theoretical literature) in quantitative studies of music and lyrics. Due to the difficulty of finding a precise method of defining lyric themes, past experimental studies have suffered from threats to construct validity.

There is a need for improvement in measurement of lyric themes and content. Evaluation of methods for concurrent, convergent, and discriminant validity is necessary. There is a need to accurately separate categories from one another, from those in similar studies, and to determine if these categories are different from those categories they should differ from.

Ecological validity. There is a need to study music and lyrics in a naturalistic way. Professional production of music and lyrics used in quantitative studies is critical. Researchers should not create experimental stimuli out of a patchwork of lyrics and music that composers never meant to link together. In addition, situations that participants usually listen to music in under normal conditions should be duplicated as closely as is practicable.

Internal validity. There is a need for improvement in controlling for confounding elements created by the music when lyrics are the independent variable. As discussed in the preceding literature review, the many variations in the numerous elements that make up a given piece of music have a continuum of their own effects. In order to compare effects of different lyric content categories, music needs to remain constant across conditions.

External validity. The majority of participants in the studies reviewed are Caucasian college undergraduates. It is not possible to generalize results of these studies to other populations. There is a need to conduct studies with samples from other populations.

Summary and conclusion. Song is the dominant form of popular music in our culture and should be studied with methodology that is valid and reliable. Although previous experimental researchers have been aware of the methodological problems and limitations in studies of music lyrics, it is very difficult to conceptualize a way to overcome the inherent nature of songs: (a) that they consist of music and lyrics meshed together into one composition, and (b) that they vary greatly in terms of the many differences in how they are structured and composed. For the sake of measuring effects on particular dependent variables, researchers have used methods of convenience and controlled independent variables to the best of their ability. Conducting a methodological study of the issues surrounding this type of research is necessary in order to make the study of music lyrics more valid, reliable, and precise.

In particular it is necessary to (a) find a way of teasing out the effect of lyrics alone apart from the effect of music, and (b) find a way to validly and reliably quantify and describe lyric content on a continuous scale. Consideration of individual differences, including familiarity, gender, musical preference, lyric comprehension, personality traits and states, and ethnicity should also be included in improved experimental designs.

Music with lyrics is the prevailing form of popular music in our society. The psychological effects of instrumental music are well-established by the literature. There is a strong theoretical foundation for the belief that lyrics, when presented in song, may exert influence of their own on human behavior, affect, and cognition. Previous experimental research indicates there is empirical evidence for this belief; however, the body of literature reviewed is lacking in validity. Therefore, there is a need for a methodological study on the subject of improving design for experimental studies of music with lyrics.

Research Questions

Methodological research questions.

1. What are best practices for methodology when studying the psychological effects of music lyrics?
2. How can song lyric themes be operationally defined so that they are consistent with theoretical literature describing the constructs they claim to represent?
3. How can song lyric content be measured on a continuous scale?
4. What are the most precise statistical methods to use when studying the psychological effects of music lyrics?

5. How can music be controlled for in studies of lyrics?

6. How can individual differences be controlled for in studies of music lyrics?

Assumptions, Limitations, Delimitations

Assumptions. This study assumes as its theoretical basis social learning theory (Bandura, 1977, 1986), the general aggression model (Carnagey & Anderson, 2003), and the general learning model (Buckley & Anderson, 2006).

Limitations. Content analysis software used in this study may be limited in its ability to analyze song lyrics. Latent semantic analysis may not sufficiently detect meaning in the text. Linguistic Inquiry Word Count may fail to properly categorize slang words or words imbedded in idiomatic expressions.

Delimitations. Study materials are limited to a sample of songs from the *Billboard Hot 100* during a 20-year period. This may limit the generalizability of results.

Glossary of Terms

Musical terms.

Accompaniment: Any part of a song's arrangement other than the lead vocal part.

Arrangement: A particular adaptation of a piece of music. Arranging can include writing parts for instruments and voices; changing chords associated with the melody; embellishing the melody in terms of pitch and/or rhythm; adding or removing song sections; and making changes in the key, style, tempo, or meter.

Blues: "A secular, predominantly black American folk music of the 20th century, which has a history and evolution separate from, but sometimes related to, that of jazz. From obscure and largely undocumented rural American origins, it became the most

extensively recorded of all traditional music types. It has been subject to social changes that have affected its character. Since the early 1960s blues has been the most important single influence on the development of Western popular music" (Macy & Grove, 2000, "Blues," para. 1).

Consonance: A combination of musical tones that is stable and lacking tension. Consonant intervals and chords sound pleasant to listeners and are used (among other places) at junctures of resolution or rest in a piece of music.

Country: "A popular music style. It has its origins in not only country dance tunes and archaic ballads of Anglo-Saxon and Celtic origins, but also 19th-century popular songs, black-American blues and gospel songs, and the sacred numbers that stemmed from the successive waves of religious revivals that began in the 18th century" (Macy & Grove, 2000, "Country," para. 1).

*Dissonance: "*A combination of tones contextually considered to suggest unrelieved tension and require resolution" (Farlex, 2010a, "Dissonance," para. 1).

Dynamics: "The intensity of volume with which notes and sounds are expressed. In the 20th century dynamics came to be seen as one of the fundamental parameters of composition which function interdependently to create musical meaning and structure" (Macy & Grove, 2000, "Dynamics," para. 1).

Electronic Signal Processing and Effects: All styles of popular music are professionally recorded with various amounts of signal processing in order to produce a musical end product of the desired loudness, dynamic content, tone quality, and stereo image. Effects are also used to create the sense of the music being played in a space of a

certain size or to add echoes (i.e., reverb and delay). Amplifiers, sound pickups, and microphones also add distinctive sonic qualities to recordings of vocals and electronic instruments. In some cases, electronic effects and signal processing are a key component of the style characteristics of a genre. For example, distorted guitars in heavy metal or long delay times in space music.

Expectancy: "refers to the idea that an antecedent event, or set of events, implies or anticipates a subsequent event or set of events. In music, this means that a given musical event or passage implies or anticipates an upcoming musical event or passage" (Schmuckler, 2008, para. 1).

Frequency: in terms of the **"**vibration of the sound waves reaching the ear: the greater the frequency, the higher the pitch" (Agnes, 2005, "Frequency,", para. 1). Certain pitches are associated with certain frequencies.

Harmony: "The combining of notes simultaneously, to produce chords, and successively, to produce chord progressions. The term is used descriptively to denote notes and chords so combined, and also prescriptively to denote a system of structural principles governing their combination. In the latter sense, harmony has its own body of theoretical literature" (Macy & Grove, 2000, "Harmony,", para. 1).

Harmonics/Overtone Series: Acoustically speaking, musical notes are composed not only of the *fundamental* frequency associated with their pitch, but also with a series of frequencies that co-occur with the fundamental in a set pattern of frequencies above it (the *overtone series)*. Although listeners consciously perceive mainly the fundamental, these *harmonics* are the source of a sound's timbre or tone color.

Heavy Metal: A style of blues-based rock music "marked by distorted guitar 'power chords' [consisting of two notes an interval of a perfect 5th apart], heavy riffs, wailing vocals and virtuosic solos by guitarists and drummers….At the height of its popularity in the 1980s, heavy metal often served as a scapegoat for social problems, through poorly-informed allegations of misogyny, Satanism, subliminal suggestions and musical impoverishment. Its lyrics addressed a wide array of issues and its music was diverse and often virtuosic. Lyrics and images often evoked horror and mysticism – just as many previous artists have in other styles – as a way of comprehending and criticizing the world and finding a place in it. Heavy metal fans became known as 'headbangers' on account of the vigorous nodding motions that sometimes mark their appreciation of the music" (Macy & Grove, 2000, "Heavy Metal" para.1-3).

Hook: The central idea of a song lyric, usually expressed in the chorus or refrain.

Instrumentation: Writing of music for particular instruments, especially referring to a composer's knowledge of what is practicable on various instruments (Kennedy & Kennedy, 2006).

Interval: The distance between two notes.

Jazz: "The term conveys different though related meanings: 1) a musical tradition rooted in performing conventions that were introduced and developed early in the 20th century by African Americans; 2) a set of attitudes and assumptions brought to music-making, chief among them the notion of performance as a fluid creative process involving improvisation; and 3) a style characterized by syncopation, melodic and

harmonic elements derived from the blues, cyclical formal structures and a supple rhythmic approach to phrasing known as swing" (Macy & Grove, 2000, "Jazz," para. 1).

Loudness: "The subjectively perceived strength of a sound. There is a complex relationship between this psychophysical quantity and objectively measured attributes of the sound wave. The loudness of a sound is most directly related to the intensity, which is the energy transmitted by the sound wave across unit area per second; it is also influenced by the duration and the frequency spectrum of the sound, and by the context in which the sound is heard" (Macy & Grove, 2000, "Loudness," para. 1).

Lyrics: The words of a song.

Melody (Tune): "A succession of notes, varying in pitch, which have an organized and recognizable shape. Melody is 'horizontal', i.e. the notes are heard consecutively, whereas in harmony notes are sounded simultaneously ('vertical')" (Kennedy & Kennedy, 2006, "Melody," para. 1).

Meter: The rhythmic pattern of a piece of music or a section of a piece of music. Meter is indicated by the *time signature*, which gives the number of beats in each bar of music and the type of note that counts for one beat. The most common time signatures in popular music are 3/4, 4/4, and 2/4.

Mixing: Combining instruments recorded on separate tracks into a single stereo recording while adding electronic signal processing and effects.

Mastering: In music production, the final technical finishing process.

Pitch or Note: "The location of a sound in the tonal scale, depending on the speed of vibrations from the source of the sound, fast ones producing a high pitch and

slow ones a low. The rate of vibration per second is the note's 'frequency'" (Kennedy & Kennedy, 2006, "Pitch,", para. 1). *Note* also refers to the written symbol of a pitch, which includes the symbol of its rhythmic duration.

Pop: A genre of popular music that "is usually understood to be commercially recorded music, often oriented towards a youth market, usually consisting of relatively short and simple love songs and utilizing technological innovations to produce new variations on existing themes. Pop music has absorbed influences from most other forms of popular music, but as a genre is particularly associated with the rock and roll, later rock style" (Wikipedia, 2010, para. 1).

Popular Music: Western song of the 20th and 21st centuries, with the exception of song in the classical style (e.g., opera).

Production: The complete process involved in creating music from selection of material to recording to mastering the finished product. Production of popular music is a complicated process that begins with composition and lyric writing and ends with mastering (a technical finishing process) of the final product.

Rap: "characterized by semi-spoken rhymes declaimed over a rhythmic musical backing, [frequently] drawn from the sampling of preexisting recordings and the use of DJ mixing techniques" (Macy & Grove, 2000, "Rap,", para. 1). This style of music has also served as a scapegoat for social problems even though, like heavy metal, lyrics have many diverse themes. Although the stereotype of rap is that it is violent, misogynistic, homophobic, and so on, rap includes themes related to education, politics, moral and religious values, and just plain fun (as in "party rap").

Rhythm: "Rhythm (in the full sense of the word) covers everything pertaining to the *time* aspect of music as distinct from the aspect of pitch, i.e. it includes the effects of beats, accents, measures, grouping of notes into beats, grouping of beats into measures, grouping of measures into phrases, etc." (Kennedy & Kennedy, 2006, "Rhythm," para. 1).

Rock: "Rock can be defined along three dimensions. Sociologically, it is a commercially-produced popular music aimed at an exclusionary youth audience of a type characteristic of late-capitalist societies. Musically, it tends to be highly amplified, with a strong beat and rhythmic patterns commonly considered erotic, and to draw heavily on proto-folk (especially African-American) musical sources from Southern USA. Ideologically, it is associated with an aesthetic programme of 'authenticity', developing elements from discourses around folk-revival ('community', 'roots') and art music ('originality', 'personal expression', 'integrity'). The sociological and musical elements are so variable, however, that the ideological dimension is the strongest factor" (Macy & Grove, 2000, "Rock," para. 2).

Song: "Short vocal composition, [with] accompaniment or solo"(Kennedy & Kennedy, 2006, "Song," para. 1).

Standard: A song that is a classic in popular music.

Style: "Style, a style or styles (or all three) may be seen in any conceptual unit in the realm of music, from the largest to the smallest; music itself is a style of art, and a single note may have stylistic implications according to its instrumentation, pitch and duration. Style, a style or styles may be seen as present in a chord, phrase, section,

movement, work, group of works, genre, life's work, period (of any size) and culture. Style manifests itself in characteristic usages of form, texture, harmony, melody, rhythm and ethos; and it is presented by creative personalities, conditioned by historical, social and geographical factors, performing resources and conventions" (Macy & Grove, 2000, "Style," para. 1).

Timbre: "Tone colour; that which distinguishes the quality of tone or voice of one instrument or singer from another, e.g. [flute] from [clarinet], [soprano] from [mezzosoprano], etc." (Kennedy & Kennedy, 2006, "Timbre," para. 1).

Tracking: The part of the recording process where instruments and vocals are either printed to tape or recorded on digital media (usually on separate tracks that will later be combined in the *mixing* process).

Linguistic terms.

Content: The message or theme of a communication.

Context: "Discourse that surrounds a language unit and helps to determine its interpretation" (Farlex, 2010b, "Context," para. 1).

Corpus: A body of texts.

Deductive Inference: "a process of [determining intended meaning] based on contextual or socio-cultural knowledge" (Rierola Puigderajols, 2001, p. 74).

Discourse Analysis: An extension of "the methods of analysis developed for the description of words and sentences to the study of larger structures in…connected discourse" (Matthews & Oxford University Press, 2003, "Discourse Analysis," para. 1).

Grammar: "Any systematic account of the structure of a language [and] the patterns that it describes" (Matthews & Oxford University Press, 2003, "Grammar," para. 1).

Hermeneutics: Theory and methodology for interpretation of texts.

Morpheme: The smallest language unit that has semantic meaning. For example, the word "unbelievable" has three morphemes (un-believe-able) and the word "orange" has only one.

Phoneme: "The smallest unit of speech that serves to distinguish one utterance from another in a language" (WETA-TV, 2008, para. 1).

Phonetics: "includes the study of the acoustic structure of speech and the mechanisms by which speech is produced and perceived (acoustic, articulatory, and auditory phonetics)" (Patel, 2008, p. 37).

Phonology: is the study of the "sound patterns of language, and includes the study of how speech sounds are organized into higher-level units such as syllables and words, how sounds vary as a function of context, and how knowledge of the sound patterns of language is represented in the mind of the speaker or listener" (Patel, 2008, p. 37).

Pragmatics: "a branch of semantics concerned with the meanings that sentences have in particular contexts in which they are uttered" (Matthews & Oxford University Press, 2003, "Pragmatics," para. 1).

Prosody: The rhythm, syllabic stress, and intonation of words which in combination may provide extra information about the meaning of a speaker or singer's words. "Traditionally, the study of metres in verse…in linguistics, of rhythm and

intonation in speech: e.g. the contour of an intonation, as falling, rising, etc., is a prosodic contour" (Matthews & Oxford University Press, 2003, "Prosody," para. 1).

Psycholinguistics: "Any study of language in or from the viewpoint of psychology" (Matthews & Oxford University Press, 2003, "Psycholinguistics," para. 1).

Semantics: "The study of meaning" (Matthews & Oxford University Press, 2003, "Semantics," para. 1).

Scansion: A system for marking strong and weak syllables in poetry or lyrics.

Signified/Signifier: A concept related to semiotics "in the account of Saussure,… a relation of mutual dependence [exists] between a concept that is 'signified'…and an 'acoustic image' of the form that 'signifies' it" (Matthews & Oxford University Press, 2003, "Signifier," para. 1). For example, the word "apple" is a sign (signifier) that signifies an actual physical apple (signified).

Sociolinguistics: Sociolinguistics is "any study of language in relation to society" (Matthews & Oxford University Press, 2003, "Sociolinguistics," para. 1).

Syntax: "The study of grammatical relations between words and other units within the sentence" (Matthews & Oxford University Press, 2003, "Syntax," para. 1).

Utterance: A string of words (Chomsky, 1957).

Chapter Three

Method

A methodological study was conducted to address the research questions enumerated in chapter 2. Methodological research can be defined as "studies that involve development, testing, and refinement of methodologies and instruments to facilitate research" (National Institute of Mental Health, 2009, para. 1). To address the research questions, a system for measuring the thematic content of music lyrics on a continuous scale was created using a combination of content analysis and principal components analysis. The validity of the scale was tested using latent semantic analysis. Then, using a small sample of lyrics, the usefulness of the scale was demonstrated. Lastly, best practices for further research on the psychological effects of music with lyrics were investigated.

Description of the research design.

Materials.

Songs. The *Billboard Hot 100* is the music industry standard for measuring the popularity of songs of all genres. A list of songs that have been in The *Billboard Hot 100* during the period from January 1, 1990 to February 23, 2010 (N = 6,989) was obtained directly from the Research Department at *Billboard.* The titles of these songs were entered into an SPSS database. Random selection was applied to the database to choose a sample of 300 songs for the principal components analysis (PCA) that followed.

Scholars disagree on the minimum sample size for factor analysis (Field, 2009; Zhao, 2009). Recommendations include a minimum sample size of 100 and a subject to

variable ratio of 5:1, but there are many other points of view. Field (2009) reviews the literature on sample size for factor analysis and concludes that a sample size of 300 should be adequate for most factor analyses; however, Field also recommends checking the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) after the analysis to confirm that the sample size was sufficient. Following this recommendation, the sample size for the initial analysis in this study was $N = 300$. In order to perform factor analysis, the KMO statistic should be at least .6 (mediocre sampling adequacy) according to Kaiser (1970). If the KMO is lower than .6 variables that do not contribute to the model will be removed until sampling adequacy is achieved.

A complete list of songs in the random sample is provided in Appendix B. Except as noted in Appendix C, all song lyrics were obtained from www.letssingit.com.

Content analysis and statistical software. The bulk of data analysis involved computerized content analysis of music lyrics. The goal of the content analysis was to produce a valid and reliable method of defining lyric content to improve the overall internal validity of studies involving music lyrics. "Although content analysis computer software programs have their limitations, these programs generally eliminate the concern of reader biases and allow large bodies of texts to be analyzed quickly and objectively" (Petterson, 2008, p. 51).

Content analysis software can be broadly categorized into qualitative and quantitative varieties. Qualitative content analysis software such as SPSS text analysis, N'vivo, and Nud*ist, analyze chunks of text according to predetermined categories and assist researchers to define new categories as they emerge from the data at hand. These

are appropriate for many applications including surveys, interviews, and customer service calls.

Quantitative content analysis software calculates frequency counts for words, word pairs, and categories; also, some programs produce cluster analysis results to identify words that occur in similar contexts. Another type of quantitative content analysis software, key word in context software (KWIC), produces an alphabetical list of all words in a document along with the context that each word appears in. Numerous commercial and free academic offerings are available in both qualitative and quantitative categories of content analysis software.

In order to assess which method of context analysis would best address the needs of the present study I considered the following: (a) will the content analysis method allow me to create a continuous scale to measure lyrics content?, (b) is the content analysis method readily available for academic use at an affordable price so that it will accessible to future researchers?, (c) is the software user-friendly so that it can be easily used by psychologists without special technical or programming knowledge?, (d) can output from the content analysis software easily be transferred to the most commonly used statistical software packages in psychological research: SPSS or SAS?, (e) is there any literature pertaining to previous use of the software package to analyze music lyrics?, and (f) does the software package allow for the extraction of meaning from text?

Three computerized quantitative content analysis methods fit all or most of my criteria for use in the study: Linguistic Inquiry Word Count (LIWC; Pennebaker, Booth, & Francis, 2007)., Diction (Digitext, Inc., 2000), and latent semantic analysis (Foltz,

1996). Diction has the advantage of being the only program that comes loaded with a collection of music lyrics for use in comparisons. However, in this study I ruled out Diction due to a lack of previous literature to support its use in studies of music lyrics. As discussed in the literature review, LIWC and LSA have been used in previous studies of music lyrics with much success.

In this study, lyrics were analyzed using the Linguistic Inquiry and Word Count program (LIWC; Pennebaker, Booth, & Francis, 2007). LIWC uses words as the unit of content analysis. The study units were all the words in the lyrics used in the experiment. LIWC (Pennebaker, Booth, & Francis, 2007) categorizes and counts words to produce a proportion of words in any given text that fall into each of the 72 categories that LIWC analyzes. LIWC grouped words by dimension and assigned a percentage frequency count to each dimension on each lyric. The words in each lyric were thus associated with numbers on a continuous scale and therefore should be easier to compare with each other and with other lyrics in a more precise way. With LIWC, quantitative comparisons of lyrics on single dimensions are already possible, but as the result of a subsequent factor analysis, simultaneous comparisons of multiple dimensions are possible.

Studies that have supported the reliability and validity of LIWC and the theory that LIWC dimensions are linked to psychological variables include Pennebaker and Francis (1996), Pennebaker and King (1999), Groom and Pennebaker (2002), and Pennebaker et al. (2003). Although reliability and validity have been demonstrated for LIWC, it is important to remember that assessing reliability and validity for text analysis

is not as straightforward as it is for questionnaires or other types of measures (Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007).

As discussed in the literature review, numerous studies have demonstrated the utility of LIWC as a tool in research involving music lyrics (e.g., Petrie et al., 2008; Petterson, 2008; Pettijohn II & Sacco Jr., 2009a, 2009b)

A table of output variable information that shows Pearson correlations between human raters and LIWC output (demonstrating validity), and Cronbach's alphas (demonstrating internal reliability) is presented in Appendix A. After the LIWC analysis was completed, SPSS version 18 software was used to conduct a principal components analysis (PCA) of the resulting data.

Lastly, latent semantic analysis (LSA) was used to provide a measure of concurrent validity for the method of scaling lyric content derived from the combination of using LIWC and PCA. LSA is "a theory and method for extracting and representing the contextual-usage meaning of words by statistical computations applied to a large corpus of text (Landauer and Dumais, 1997)" (Landauer et al., 1998, p. 2). LSA allows comparisons of texts. Texts are analyzed in LSA within the context of a *corpus* or *semantic space* (a representative comparison group of linguistically similar material). For the purpose of this study, lyrics were analyzed using the LSA matrix application available at http://lsa.colorado.edu/. This application allows document-to-document comparisons between lyrics and produced a matrix displaying cosine similarity coefficients for each lyric pair. The values for cosine similarity in text analysis are 0 to 1, with 1 indicating that the texts are identical and 0 indicating independence. In addition,

> Unlike methods which rely on counting literal word overlap between units of text, LSA's comparisons are based on a derived semantic relatedness measure which reflects semantic similarity among synonyms, antonyms, hyponyms, compounds, and other words that tend to be used in similar contexts. In this way, it can reflect coherence due to automatic inferences made by readers as well as to literal surface coreference. (Foltz, Kintsch, & Landauer, 1998, p. 286)

Procedure.

Random sampling of songs. The original Excel file that was obtained from *Billboard* containing a list of songs that were in the *Billboard Hot 100* from January 1, 1990 to February 23, 2010 (N = 6,989) was opened from within SPSS. SPSS was then used to select a random sample of 300 lyrics from the database. A list of the 300 songs in the random sample appears in Appendix B.

Lyrics were obtained for the 300 songs in the random sample. The primary source of lyrics was www.letssingit.com. Additional sources of lyrics are listed in Appendix C.

LIWC analysis. Each lyric in the sample was saved in a separate plain text file. The files were placed in one folder. Using LIWC, the entire folder was selected for processing so that the entire sample of lyrics was analyzed all at once. The analysis was performed using the internal LIWC2007 dictionaries and set to analyze all categories. The resulting .dat file was saved and then opened from within SPSS. A file format wizard appeared at that point and an SPSS database was set up with song titles as case identifiers and the LIWC dimensions as variables.

Principal components analysis. The SPSS database created from the LIWC analysis was used to reduce relevant LIWC dimensions to a smaller number of factors.

PCA was conducted using SPSS. LIWC dimensions included in the PCA were psychological processes, all personal concerns, negations, assent, and swear words. Psychological process categories are social processes, family, friends, humans, affective processes, positive emotion, negative emotion, anxiety, anger, sadness, cognitive processes, insight, causation, discrepancy, tentative, certainty, inhibition, inclusive, exclusive, perceptual processes, see, hear, feel, biological processes, body, health, sexual, ingestion, relativity, motion, space, and time. Personal concern categories are work, achievement, leisure, home, money, religion, and death. Swear words and negations are categories in linguistic processes. Assent is one of the spoken dimensions. LIWC dimensions excluded in the analysis were relativity, pronouns, and miscellaneous dimensions. Dimensions were chosen on the basis that the included dimensions would provide information about the target concept: thematic content. Although the excluded dimensions have been shown in the past to provide information about the writer's health or psychological state (e.g., Stirman & Pennebaker, 2001), they are not known to provide data regarding thematic content.

Prior to the analysis, data were screened. Using Mahalanobis distance, outliers were identified and eliminated. The data were checked for normality and linearity, and transformations were applied to the data. Details of the data screening process are discussed in the results section.

According to Kaiser's rule (1960), SPSS was set to retain components with an eigenvalue greater than 1. Varimax rotation was used.

The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was checked after the analysis to confirm that the sample was appropriate for factor analysis. The KMO statistic should be at least .6 (mediocre sampling adequacy; H. F. Kaiser, 1970) for factor analysis to proceed. The KMO statistics are discussed in the results section.

The factors produced in the initial analysis were interpreted on the basis of the variance that each factor explains. Factors that provide only a small amount of explained variance, but were judged as providing information about thematic content in the lyrics were retained. Otherwise, only factors that explain a large portion of the variance were retained in the final solution. Judgments about whether factors explaining a small amount of the total variance should be included in the final solution were made on a subjective basis in light of what the factors conceptually represent.

The process of naming the factors consisted of (a) examining each component in terms of positive and negative loadings, (b) ordering each variable within a component by strength, and (c) examining the content of variables within each component. Factors were then named in accordance with a subjective judgment of what constructs were represented by a combination of the ordered variables.

Factor scores for each lyric estimated the score each song would have received if measured directly on the newly extracted factors. The scores provide a way to measure each song on a continuous scale on every factor. Factor scores were obtained using the regression method. The factor scores that correspond with each lyric were saved as variables in the SPSS database.

Finally, multipliers for each variable were obtained from the PCA output to provide a way to score and combine LIWC variables so that researchers may use the resulting factor structure in future research. The system of quantifying thematic content was demonstrated and tested using a small sample of songs from previous research.

LSA analysis. The analysis of concurrent validity within LSA involved 6 comparisons, one to test each factor in the final PCA solution.

A sample of study lyrics was obtained on the following basis: (a) descriptive statistics were obtained for the factor scores on each of the 6 components; (b) the data were explored and 5 songs scoring lowest, highest, and closest to the mean were identified for each factor; (c) this resulted in a sample of $N = 15$ for each comparison within LSA. A list of songs used in the LSA analysis appears in Appendix D.

The selected lyrics for each of the comparisons were pasted into the LSA matrix application available online at the LSA at the Colorado University, Boulder website at http://lsa.colorado.edu. There were no blank spaces within lyrics. Each lyric was separated by a blank space. The topic space "General Reading up to 1st year college (300 factors)" was selected. Document to document was selected for the comparison type. The maximum available factors were used (300). The cosine similarity matrices that resulted from the LSA analysis were examined to see if the factors obtained in the PCA overlapped with the meaning extracted by the LSA analysis. To provide a measure of concurrent validity, LSA should indicate a high similarity between lyrics at extremes and independence between those at opposite extremes.

Testing and demonstration of the factor scoring method. To demonstrate and test the new method of quantifying lyric themes on a continuous scale, songs that were used in two previous studies (Anderson, Carnagey & Eubanks, 2003; Treadwell, 2006) were analyzed using LIWC and factor scored on the new components.

Preparation of results. Using the review of the literature as a foundation, and the general learning model as a theoretical basis, detailed recommendations for methodology are made in Chapter 5. These recommendations include instructions for utilizing the new factor scoring system to quantify content in music lyrics. Research designs for detecting both short- and long-term effects are discussed. The recommendations address all of the issues enumerated in the statement of the problem and the methodological research questions. Recommendations for data analysis of experiments are provided. Practical application of the continuous scale for lyric content is discussed and demonstrated in the context of the theoretical research model.

Chapter Four

Results

Data screening. To detect outliers, Mahalanobis distance was calculated for each of the 300 songs in the LIWC analysis. Thirty-four multivariate outliers outside the critical chi square value were identified, χ^2 (42, N=266) = 78.08, p=.001. These outliers represented 11.3% of the total sample. The outliers were removed from the dataset in subsequent analyses. One additional song was removed from the dataset because the lyrics are in Spanish and LIWC does not analyze words in Spanish.

The data were explored for normality. All but two of the variables (social and cognitive processes) significantly differed from normality and were substantially positively skewed so, in an attempt to normalize the data, each variable was transformed using a square root transformation. The square root transformations resulted in normalized distributions for many of the variables (negations, positive emotions, negative emotions, insight, discrepancy, inclusive, exclusive, perceptual processes, biological processes, relativity, and space) and positive skew was reduced for the remainder of the variables.

Principal components analysis. The initial principal components analysis of the 42 included LIWC dimensions indicated a significant Bartlett's test of sphericity, χ^2 (861) = 5231.841, p<.000, which indicates the data are appropriate for PCA. Conversely, the KMO measure of sampling adequacy was only .403, an indication of a lack of data appropriate for PCA. However, Velicer and Fava (1998) contend that weaknesses in a dataset can be partially compensated for by strengths present in the same data, and there is a school of thought that contradicts the conventional wisdom about the importance of the KMO,

placing more importance on high communality (shared variance) levels (Costello & Osborne, 2005; MacCallum, Widaman, Zhang, & Hong, 1999) and anti-image correlations (Field, 2009). Therefore, the PCA was inspected for low communalities. Although there were several low communalities, the average communality was adequate at .706. It was then considered that increasing the sample size might be a solution for improving the KMO, so a database containing dummy LIWC data for 800 songs was analyzed. The KMO did not improve. Considering that PCA is an exploratory technique that is prone to error and not intended for population inference, Costello and Osbourne (2005) note that, even with large sample sizes and other optimal conditions, the results of any type of factor analysis should be interpreted with caution. Taking this into consideration, an increase in the sample size was ruled out as a viable solution to problems with the data.

According to Field (2009), the anti-image correlation matrix is useful for examining the value of each variable for the purpose of PCA (it provides a measure of sampling adequacy for each variable, as opposed to the KMO, which examines the adequacy of the overall dataset). Therefore, the anti-image correlation matrix was examined on the diagonal to evaluate all of the 42 originally included variables. Ideally, the anti-image correlation for each variable should be greater than .5 (Field, 2009). Eighteen dimensions had an anti-image correlation lower than .4: biological processes, ingestion, anxiety, discrepancy, perception, relativity, causation, certainty, inhibition, inclusive, see, hear, feel, body, health, time, space, and motion. These dimensions were removed from the dataset and a new PCA was run with the remaining 24 dimensions. This analysis resulted in a KMO of

.612, an acceptable statistic that, according to Kaiser (1974), falls within the range of mediocre sampling adequacy. Therefore, the PCA was now analyzed for a factor solution.

The solution automatically generated by the resulting PCA (set to return components with eigenvalues greater than 1) suggests a 9-factor solution that explains 67% of the total variance. However, the goal of the present research is not to explain maximum variance; but rather, to explain as much as possible with the fewest variables so that the resulting factors will be useful to future researchers. Therefore, based on an evaluation of the scree plot, 6- and 7-factor solutions were tried. The 6-factor solution explained 53.66% of the variance and the 7-factor solution was able to explain 58.3% of the variance. Both the 6- and 7-factor solutions are conceptually comprehensible and make sense in the context of examining song lyrics. The factors in both solutions were named on the basis of examining the positive and negative loadings for each variable on each component in the rotated component matrix. Table 1 shows a comparison between the names of the components in each of the solutions. Note that the main difference between the two solutions is that Factor 5 (Daily Concerns) in the 6-factor solution is divided into two parts in the 7-factor solution (Factors 5 and 6, Personal Issues and Social Life, respectively). At first it seemed that the extra specificity in the 7-factor solution provided the best solution; however, after factor scores were obtained for each factor on each song in the sample and the songs scoring highest, lowest, and closest to the mean were determined for each factor, Factor 6 in the 7-factor solution did not seem to fit the content of the songs that scored highest. Although sexuality was slightly negatively loaded on Factor 6, the songs that scored highest for Factor 6 were highly sexual in nature. It is possible that this is due to the

limitations of the LIWC method, namely, that LIWC is not designed to detect meaning from text. Therefore, factor scores were obtained for each song based on the 6-factor solution and the songs highest, lowest and at the mean for the 6-factor solution were examined. At this point, the 6-factor solution appeared to have face validity and it became clear that the 6-factor solution was superior to the 7-factor solution.

Table 1

Comparison Between 6- and 7-Factor Solutions to Explain Variance in LIWC Dimensions

Factor	6-Factor Solution	7-Factor Solution
1	Positive feelings and Romantic Relationships	Positive feelings and Romantic Relationships
2	Inner Thoughts/Reflections and Desires	Inner Thoughts/Reflections and Desires
3	Anger and Impulsivity	Anger and Impulsivity
4	Negative Emotions/Melancholy	Negative Emotions/Melancholy
5	Daily Concerns	Personal Issues
6	Death, Isolation, and Religion	Social Life
7	----	Death and Religion

Table 2 shows the rotated component matrix for the 6-factor solution. Loadings less than .3 are suppressed.

Table 2

Factor Loadings for PCA with Varimax Rotation of LIWC Dimensions

LIWC Dimension	Positive Feelings and Romantic Relationships	Inner Thoughts, Reflections, and Desires	Anger and Impulsivity	Negative Emotions/ Melancholy	Daily Concerns	Death, Isolation, and Religion
Positive emotion	.894					
Sexual	.836					
Affect	.807			.481		
Social Processes	.445				.343	-.433
Exclusive		.777				
Cognitive Processes		.706	-.357			
Tentative		.634				
Negations		.530				
Leisure		-.416				
Insight		.388	-.330		-.326	
Anger			.824			
Swear Words			.823			
Money			.516			
Sadness				.896		
Negative Emotions			.343	.880		
Family					.655	
Friends					.575	
Work					.563	
Humans					.487	-.609
Assent		-.330				-.486
Religion						.425
Achievement					.319	.418
Death			.309			.410
Home						.397

Note. Factor loadings < .30 not shown.

LSA analysis. Tables 3-8 show the cosine similarity matrices that resulted from the LSA analysis. These were examined to see if the factors obtained in the PCA overlapped with the meaning extracted by the LSA analysis. For each factor, the mean cosine similarity coefficient was calculated for each factor score level (low, mean, and high). The means at the extremes for each factor are shown in Table 9. In order to provide a good measure of concurrent validity, LSA should indicate a high similarity between lyrics at extremes and independence between those at opposite extremes. For Factors 1 (Positive Feelings and Romantic Relationships) and 2 (Inner Thoughts/Reflections and Desires), as expected, there is more similarity between the high scores than between the low and high scores; however, the low scores do not show a high level of similarity. For Factors 3 (Anger and Impulsivity), 4 (Negative Emotions/Melancholy), and 5 (Daily Concerns) there is not as much distinction between the factor score levels. For Factor 6 (Death, Isolation, and Religion), there is more similarity between the low scores, but there is not much difference in similarity between the high scores and the average similarity between low and high scores. It is possible that the nature of LSA did not allow for complete meaning extraction – this will be discussed in Chapter 5.

Table 3

Factor 1: Positive Feelings/Romantic Relationships Cosine Similarity Matrix Comparison

Song	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	---	0.66	0.28	0.55	0.39	0.60	0.64	0.40	0.52	0.60	0.56	0.59	0.59	0.64	0.59
2			0.39	0.69	0.42	0.59	0.68	0.49	0.66	0.58	0.63	0.69	0.49	0.59	0.78
3				0.37	0.20	0.34	0.32	0.24	0.41	0.25	0.29	0.36	0.23	0.28	0.30
4					0.32	0.58	0.55	0.36	0.56	0.41	0.48	0.63	0.49	0.58	0.64
5						0.33	0.32	0.50	0.41	0.46	0.38	0.39	0.34	0.33	0.35
6							0.55	0.53	0.50	0.54	0.58	0.67	0.65	0.59	0.61
7								0.41	0.54	0.56	0.50	0.62	0.55	0.66	0.70
8									0.52	0.50	0.50	0.61	0.43	0.44	0.57
9										0.50	0.52	0.67	0.50	0.55	0.74
10											0.59	0.51	0.55	0.56	0.58
11												0.64	0.54	0.53	0.64
12													0.58	0.70	0.76
13														0.74	0.55
14															0.66
15															---

Note: For this factor, songs 1-5 are low scores, songs 6-10 are scores closest to the mean, and songs 11-15 are high scores.

Table 4

Factor 2: Inner Thoughts/Reflections and Desires Cosine Similarity Matrix Comparison

Song	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	---	0.46	0.20	0.50	0.34	0.46	0.51	0.49	0.36	0.47	0.35	0.44	0.30	0.41	0.34
2			0.25	0.56	0.55	0.45	0.67	0.70	0.61	0.69	0.61	0.62	0.60	0.56	0.55
3				0.28	0.33	0.22	0.34	0.35	0.33	0.38	0.33	0.34	0.27	0.28	0.32
4					0.39	0.41	0.59	0.66	0.57	0.64	0.53	0.63	0.53	0.58	0.54
5						0.41	0.58	0.65	0.63	0.65	0.64	0.55	0.59	0.56	0.60
6							0.64	0.61	0.47	0.56	0.49	0.55	0.46	0.44	0.55
7								0.82	0.69	0.76	0.71	0.71	0.68	0.71	0.73
8									0.73	0.81	0.77	0.72	0.70	0.69	0.73
9										0.78	0.66	0.64	0.60	0.70	0.71
10											0.72	0.73	0.66	0.73	0.74
11												0.71	0.69	0.62	0.72
12													0.76	0.71	0.77
13														0.73	0.73
14															0.73
15															---

Note: For this factor, songs 1-5 are low scores, songs 6-10 are scores closest to the mean, and songs 11-15 are high scores.

Table 5

Factor 3: Anger and Impulsivity Cosine Similarity Matrix Comparison

Song	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	---	0.61	0.51	0.58	0.59	0.26	0.62	0.54	0.63	0.60	0.68	0.63	0.61	0.47	0.55
2			0.60	0.65	0.70	0.23	0.60	0.66	0.68	0.65	0.69	0.64	0.63	0.54	0.57
3				0.61	0.63	0.29	0.59	0.57	0.64	0.57	0.54	0.67	0.62	0.51	0.54
4					0.67	0.32	0.64	0.65	0.65	0.61	0.65	0.63	0.66	0.61	0.60
5						0.29	0.62	0.69	0.70	0.68	0.67	0.69	0.67	0.60	0.58
6							0.38	0.28	0.36	0.23	0.32	0.37	0.40	0.29	0.35
7								0.64	0.79	0.67	0.72	0.76	0.72	0.51	0.59
8									0.77	0.66	0.66	0.71	0.71	0.58	0.57
9										0.73	0.75	0.79	0.78	0.65	0.67
10											0.69	0.67	0.68	0.63	0.59
11												0.78	0.73	0.54	0.67
12													0.78	0.58	0.71
13														0.65	0.70
14															0.57
15															---

Note: For this factor, songs 1-5 are low scores, songs 6-10 are scores closest to the mean, and songs 11-15 are high scores.

Table 6

Factor 4: Negative Emotions/Melancholy Cosine Similarity Matrix Comparison

Song	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	---	0.71	0.64	0.66	0.60	0.68	0.64	0.73	0.66	0.67	0.81	0.64	0.55	0.46	0.57
2			0.77	0.62	0.50	0.64	0.67	0.71	0.61	0.64	0.69	0.60	0.68	0.43	0.55
3				0.57	0.45	0.62	0.73	0.65	0.56	0.61	0.68	0.58	0.67	0.43	0.49
4					0.62	0.58	0.60	0.60	0.63	0.60	0.66	0.52	0.61	0.41	0.52
5						0.72	0.48	0.56	0.65	0.64	0.57	0.52	0.50	0.53	0.61
6							0.63	0.67	0.72	0.76	0.67	0.64	0.57	0.49	0.68
7								0.66	0.55	0.65	0.72	0.62	0.59	0.47	0.44
8									0.62	0.67	0.71	0.68	0.60	0.45	0.57
9										0.73	0.65	0.56	0.57	0.44	0.63
10											0.65	0.59	0.60	0.51	0.69
11												0.72	0.61	0.56	0.53
12													0.55	0.62	0.54
13														0.38	0.48
14															0.60
15															---

Note: For this factor, songs 1-5 are low scores, songs 6-10 are scores closest to the mean, and songs 11-15 are high scores.

Table 7

Factor 5: Daily Concerns Cosine Similarity Matrix Comparison

Song	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	---	0.37	0.59	0.55	0.55	0.56	0.56	0.65	0.65	0.54	0.46	0.20	0.53	0.47	0.59
2			0.28	0.34	0.37	0.22	0.23	0.29	0.33	0.24	0.29	0.16	0.28	0.26	0.38
3				0.60	0.55	0.54	0.51	0.64	0.60	0.58	0.41	0.17	0.51	0.53	0.51
4					0.58	0.54	0.54	0.65	0.54	0.55	0.51	0.30	0.48	0.52	0.54
5						0.47	0.46	0.61	0.68	0.51	0.45	0.18	0.47	0.47	0.63
6							0.66	0.77	0.54	0.77	0.46	0.25	0.62	0.56	0.53
7								0.69	0.63	0.63	0.45	0.18	0.58	0.61	0.60
8									0.75	0.79	0.50	0.24	0.66	0.65	0.68
9										0.62	0.44	0.15	0.52	0.53	0.70
10											0.50	0.22	0.63	0.62	0.62
11												0.36	0.55	0.57	0.59
12													0.42	0.25	0.29
13														0.58	0.62
14															0.62
15															---

Note: For this factor, songs 1-5 are low scores, songs 6-10 are scores closest to the mean, and songs 11-15 are high scores.

Table 8

Factor 6: Death, Isolation, and Religion Cosine Similarity Matrix Comparison

Song	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	---	0.78	0.73	0.48	0.78	0.75	0.62	0.78	0.54	0.71	0.52	0.58	0.67	0.48	0.46
2			0.79	0.51	0.81	0.77	0.68	0.80	0.61	0.77	0.57	0.53	0.70	0.48	0.52
3				0.49	0.77	0.68	0.67	0.72	0.51	0.76	0.44	0.47	0.79	0.37	0.48
4					0.49	0.54	0.47	0.58	0.37	0.52	0.31	0.29	0.40	0.34	0.39
5						0.80	0.73	0.79	0.55	0.78	0.56	0.53	0.79	0.44	0.53
6							0.77	0.80	0.69	0.70	0.54	0.60	0.70	0.45	0.59
7								0.74	0.64	0.66	0.51	0.54	0.66	0.37	0.56
8									0.65	0.73	0.53	0.53	0.66	0.51	0.58
9										0.48	0.43	0.44	0.46	0.33	0.45
10											0.54	0.58	0.78	0.44	0.59
11												0.52	0.42	0.49	0.57
12													0.47	0.52	0.60
13														0.31	0.49
14															0.54
15															---

Note: For this factor, songs 1-5 are low scores, songs 6-10 are scores closest to the mean, and songs 11-15 are high scores.

Table 9

Mean Cosine Similarity Coefficients at Factor Score Extremes

Mean Similarity Between	Factor					
	1	2	3	4	5	6
Songs 1-5 (low scores only)	.427	.386	.615	.614	.478	.663
Songs 11-15 (high scores only)	.634	.717	.671	.559	.485	.493
Songs 1-5 and Songs 11-15 (low and high scores)	.489	.483	.61	.571	.412	.506

Demonstration and testing of the scoring method for lyrics' thematic content.

As previously discussed, factor scores for each song in the study were obtained in SPSS using the regression method. Besides the regression method, there are multiple methods available for factor scoring a given item (DiStefano, Zhu, & Mindrilă, 2009). A simple way to implement factor scoring is to use component coefficients as multipliers for raw scores and then to add the scores on each variable for each component together to create a total factor score for each of the factors for each of the songs. Table 10 shows the coefficients obtained for the factor scores in this study.

Table 10

Components Score Coefficient Matrix for LIWC Dimensions

LIWC Dimension	Positive Feelings & Romantic Relationships	Inner Thoughts, Reflections, and Desires	Anger and Impulsivity	Negative Emotions/ Melancholy	Daily Concerns	Death, Isolation, and Religion
Work	-.026	.035	.050	-.013	.282	.086
Achievement	.072	.061	.005	-.021	.155	.264
Leisure	-.029	-.158	.007	-.080	.020	-.045
Home	-.024	-.102	-.161	.107	.129	.251
Money	-.025	.014	.222	-.042	.100	-.134
Religion	.049	-.121	-.111	.010	.072	.280
Death	-.013	.099	.109	-.053	.066	.240
Assent	-.044	-.169	-.053	.084	.000	-.319
Social Processes	.137	.066	-.068	.054	.226	-.259
Cognitive Processes	-.027	.266	-.085	-.039	-.039	-.016
Sexual	.361	.026	.085	-.113	-.073	.033
Anger	.023	.049	.386	.052	-.087	-.014
Sadness	-.076	-.036	-.128	.466	.085	-.027
Insight	-.009	.116	-.096	.035	-.121	.016
Tentative	.016	.287	.036	-.050	.091	.071
Exclusive	-.007	.354	.088	-.096	.074	-.033
Negations	.014	.211	.023	.083	.001	-.009
Swear Words	.076	.011	.399	-.053	-.114	-.014
Family	-.093	.006	-.074	.035	.364	.071
Friends	.032	.017	-.087	.043	.329	-.007
Humans	.022	.030	.056	-.006	.271	-.409
Affect	.313	-.004	.051	.183	-.038	.040
Positive Emotions	.370	-.009	-.012	-.104	-.002	.076
Negative Emotions	-.034	.023	.130	.420	-.012	-.051

To test the utility of the method for scoring songs, I analyzed a total of six songs. Two songs ("Jerk Off" and "Four Degrees" by Tool) were both used in two previous studies (Experiments 1 and 2 of Anderson, Carnagey, & Eubanks, 2003; and Treadwell, 2006); two additional songs ("I Wouldn't Mind" and "Love vs. Loneliness" by Suicidal Tendencies) were used in Experiment 3 of Anderson et al. (2003); lastly, I included two songs of my own choosing: "Cop Killer" (Ernie C. & Ice-T, 1992) and "Girls Just Want to Have Fun" (Hazard, 1979).

In the previous studies "Jerk Off" and "I Wouldn't Mind" were designated as violent songs. "Four Degrees" and "Love vs. Loneliness" were designated as non-violent songs. To serve as contrasting examples to the content in the lyrics from the previous studies, I chose the song "Cop Killer" to represent a song with unambiguous lyrics about random violence, and the song "Girls Just Want to Have Fun" to represent a song with lighthearted non-violent lyrics.

First, using the internal LIWC dictionary, the songs were analyzed in LIWC on the 24 dimensions retained in the factor analysis. Next, scores were created on each of the 6 factors by (a) multiplying the resulting LIWC score on each of the 24 dimensions by the appropriate component score coefficient from Table 10, and (b) adding the scores together to achieve a total score for each song on each factor. Table 11 shows the factor scores obtained for each of the 6 songs. The scores and suggested applications for using them will be discussed in Chapter 5.

Table 11

Factor Scores for Songs in Test Group

Song	Factor Score					
	Positive Feelings & Romantic Relationships	Inner Thoughts, Reflections, and Desires	Anger and Impulsivity	Negative Emotions/ Melancholy	Daily Concerns	Death, Isolation, and Religion
Jerk Off (violent)	4.90005	6.13227	-0.87663	0.81673	1.49513	-1.76471
Four Degrees (nonviolent)	4.8219	10.75546	1.03205	1.92172	1.87999	-2.1216
Love vs. Loneliness (nonviolent)	9.99477	12.64066	-1.37904	6.60144	3.28715	-4.92475
I Wouldn't Mind (violent)	4.23582	12.45738	-1.47178	5.15439	1.00348	-3.6705
Girls Just Want To Have Fun (nonviolent)	4.47849	12.34959	-2.45641	-0.16416	7.46464	-9.31736
Cop Killer (violent)	11.71996	5.65514	15.83389	11.09929	-0.06561	1.76295

Chapter Five

Discussion

Summary of findings.

Discussion of outliers. Prior to the PCA, songs that were outliers in the LIWC analysis were removed from the dataset. I examined these lyrics to determine whether there was something unusual about them that made them outliers. The songs in the group of multivariate outliers contained identifiable thematic material that is less frequently found in the *Billboard Hot 100.* Specifically, for the LIWC religion dimension (M=0.38, SD=0.80 for the random sample) the songs "Holy Water" and "My City of Ruins" scored high (5.77 and 6.23, respectively) placing them more than 3 standard deviations above the mean. Three more songs in the group of outliers were more than 2 standard deviations above the mean on the religion dimension "Keep Warm" (2.02), "Mother" (2.65), and "Rapture" (2.71). Novelty songs also appeared on the list of outliers. For example, the song "Car Wash" scored highest (6.06) of any song in the sample (M=0.36, SD=.65) on the LIWC dimension for work, placing it more than 3 standard deviations above the mean. Another novelty song on the list of outliers, "[If I was a] Rich Girl," is about a woman's fantasy of becoming wealthy. The song scored higher on the money dimension (5.5) than any other in the sample (M=.38 SD=.63) placing it more than 3 standard deviations above the mean. Two other multivariate outliers with unusual thematic content scored highest on the causation variable (M=1.59, SD=1.40): "Vitamin R," a song about the drug Ritalin, scored 8.55; and "Larger Than Life," a song about the effect of an adoring audience on a band, scored 9.09 placing both songs more than 3 standard deviations above the mean.

My subjective judgment of the 34 outliers detected during screening of the data is that they are songs that would have had too much influence on the PCA considering the rare qualities of their thematic content. Although the outliers were not suitable for the PCA, the songs would be well-suited to scoring using the new method, which would retain information about the uniqueness of the songs, while measuring them on a set of six continuous scales for content (corresponding to the 6-factor solution).

Principal components analysis. The 6-factor solution obtained from the PCA provides a way to score song lyrics on a set of six continuous scales by using component score coefficients as multipliers for scores on 24 dimensions of LIWC. Using the valid and reliable LIWC scores as the foundation for the PCA provided a good basis for deriving the factors. The factors cover a wide range of thematic content and the use of multiple factors to describe song lyric themes allows for description of subtle characteristics of content. The main drawback to using LIWC as the source of scores for the PCA is that LIWC does not detect meaning in text. Idiomatic expressions, commonly used in song lyrics, are not decoded by LIWC. Also, although LIWC dictionaries contain both slang and swear words, some slang words of recent origin (e.g., "shorty," "feenin'") were not detected by LIWC's internal dictionaries. However, the large random sample used in this study should have allowed for error to be minimized. The demonstration of the scoring system illustrates the validity and usefulness of the 6-factor solution for describing lyrical content.

Latent semantic analysis. In general, the direction of the similarities derived in the LSA is as expected and provides some support for the validity of the PCA; however, the LSA did not separate the songs scoring high and low on the various factors as well as

anticipated and the results are somewhat inconsistent. This does not necessarily indicate a problem with the PCA; but more likely, points to the limitations of LSA, which was designed for analyzing academic, rather than artistic text. LSA is probably not the best choice for analyzing song lyrics for several other reasons: It does not detect the meaning of slang, is designed to analyze academic language, and may sort meaning on a grosser level than the PCA was able to detect. For example, one reason why differences between songs did not get picked up by the LSA could be that so many popular songs are related in some way to romantic relationships; therefore, despite other differences, this similarity may have overshadowed other elements that were detected by the PCA.

Demonstration and testing of scoring method. Although the songs were classified simply as violent or nonviolent in previous studies (Anderson et al., 2003; Treadwell, 2006), the factor scores presented in Table 11 provide more detail about the differences and similarities between the songs used in those studies. If the previous violent categorizations were valid I expected that the violent songs would score high on the Anger and Impulsivity factor; however, the two songs that were previously designated as violent both scored negatively on this factor. I also expected that violent songs would score higher on Negative Emotions/Melancholy than the songs by the same artists that were designated nonviolent; however, the songs scored lower on this factor than their non-violent counterparts. Overall, similarities and differences in these factor scores appear to be more consistent with differences between the artists than between the songs designated as violent or nonviolent. The factor scores have picked up on subtleties that binary categories could not. For example, the songs “Jerk Off” and “I Wouldn’t Mind” are both songs about revenge

fantasies – this is reflected in the lack of negative emotions and anger/impulsivity in the factor scores – the lyrics indicate a cold resignation to act. “Love vs. Loneliness” is an emotionally intense lyric – this is reflected in high scores for the two affective factors: Positive Feelings and Romantic Relationships, and Negative Emotions/Melancholy. “Four Degrees” is a lyric that employs anal sex as a metaphor with several possible meanings; the ambiguity of the lyric is illustrated by the mixed bag of mostly moderate factor scores.

To say that the songs analyzed above are simply violent or nonviolent is an oversimplification at best, and a misrepresentation at worst. These songs are complex and deeper in meaning than some pop songs, but they do represent popular songs of the last 20 years that were familiar to college students at the time of the Anderson et al. (2003) study. The new method of scoring the songs is a better way of describing the songs because it captures more nuanced meaning.

The validity of the scoring method is best demonstrated by the factor scores obtained for the two songs I chose for their unambiguous lyrics. The songs score on opposite ends of the spectrum on every factor. The differences between them are reflected in the factor scores in obvious, as well as subtle, ways. For example, the finding that the two songs score differently on Anger and Impulsivity is not surprising; however, it is interesting that they score so differently on Positive Emotions and Romantic Relationships. “Cop Killer” scores higher than any other song in the test group on Positive Emotions and Romantic Relationships, which is interesting because the method picked up the positive feeling that the lyric expresses about the violent actions it describes. This is an important difference from the other songs that were designated as violent. “Girls Just Want To Have

Fun" scores high on Inner Thoughts, Reflections, and Desires, and Daily Concerns, and also low on Death, Isolation, and Religion. These scores reflect the in-the-now lightness of the song about girls' longings.

The demonstration of the factor scoring method shows how songs can be sorted according to type of violence rather than simply as to whether they are violent or not. Revenge fantasies about specific former abusers are very different expressions than exhortations to kill random police officers (even though the singer specifies that he has felt abused by police in general). Subjectively speaking, the type of violence described in "Cop Killer" is more antisocial in nature than the violence described in either of the two revenge fantasy songs and this has been quantified by the factor scoring method. Just as intended, the method provides a more precise way of quantifying lyric content. Besides violent content, the method can be used to quantify subtle distinctions among groups of any subtype of lyrical content (e.g., prosocial, religious, etc.).

Conclusions and implications of the results.

Consideration of the findings in the context of existing research. The new method of scoring lyric themes worked well in the demonstration and illustrated that the four songs used in previous studies could be defined more precisely than by using the earlier violent/non-violent categorizations. My subjective analysis of these lyrics is consistent with the factor scores and indicates that they are much more complicated than the binary descriptions ascribed to them by Anderson et al. (2003). Now that the songs are scored on six continuous scales, more information about their effects could be obtained by utilizing regression analysis to examine the relationships between the factors and any dependent

variables of interest. Most importantly, the construct validity of studies using music lyrics as independent variables can be improved by the use of the factor scoring method. Lyric themes in the real world exist on a continuum that is now possible to represent in multiple dimensions through quantitative analysis.

It is likely that, like the songs used in Anderson et al. (2003), song meanings were oversimplified or even misidentified in other studies of the psychological effects of music lyrics that employed categorical descriptions of thematic content (e.g., Bagwell, 1997; Cohen, 2004). Conversely, it is possible that the factor scoring method will not pick up on meanings imbedded in idiomatic expressions, slang, or historical word associations. To illustrate this potential downfall of the method, I analyzed the song "Helter Skelter" (Lennon & McCartney, 1968) using LIWC. The song was previously categorized as a non-violent song by Smith (1995). In the literature review, I pointed out that the quantitative method used for song selection in Smith's study failed to detect the historical association of the words "Helter Skelter" with the Manson Family. I discussed how this might have impacted the validity of the study. Similarly, in my LIWC analysis, the song scored 0 on the negative emotions, anxiety, anger, sadness, and death dimensions. This indicates to me that, as expected, LIWC is not capable of properly assisting in description of this particular song. However, this song has particular associations that would make it difficult to categorize by any method. For songs that are more typical, many difficulties in detecting meaning (especially due to slang usage) could be overcome by enhancing dictionaries in LIWC with up-to-date slang. This would be easy to do if a relatively small selection of songs is being analyzed. The songs could be individually evaluated for slang content, the

slang meanings could be researched, and the slang words could be added to the dictionary being used to analyze words in LIWC. The same coefficients used in the original scoring method could then be used for factor scoring because the system would be enhanced by the addition of more slang words, rather than changed by it.

In addition to the strengths of the factor scoring method discussed above, the method allows for comparisons between studies using a common scoring scale, removes error due to individual differences in subjective judgments, and provides a consistent and reliable way for researchers to operationally define independent variables in studies of music with lyrics. The main drawback of the method is that it cannot provide absolute meaning extraction, especially when slang, idiomatic expressions, metaphors, and double meanings are involved (as is frequently the case with song lyrics). To overcome the weakness of the method, human raters should also evaluate lyrics being factor scored so that anomalous language that may create a source of error can be detected.

Previous studies used LSA to examine song lyrics (Logan et al., 2004; Petrie et al., 2008). In light of the findings in this study, it is possible that a lack of complete meaning extraction may have occurred in these studies. It would be interesting to examine the songs used in the previous studies using the new scoring method to see if the LSA analysis held up in comparison to analysis of the resulting factor scores.

Implications for further research based on current theory. Social learning theory (Bandura, 1977, 1986), the general aggression model (Carnagey & Anderson, 2003), and the general learning model (Buckley & Anderson, 2006) offer explanations of media effects that consider many nuances of the human/media interaction. To date, a missing

element in studies based on these theories has been an equally nuanced method of operationally defining media content when utilizing media, such as music with lyrics, as independent variables in experimental studies. The factor scoring method for songs will allow for the application of these theories to studies that will provide more valid, reliable, and specific information about the psychological effects of songs. Future researchers should consider how to develop similar methods to measure content in other media such as films, television programs, and websites. This will allow the application of the general learning model to a wide variety of media studies that will be more precise, valid, and reliable than previous studies.

Limitations of the study. As previously discussed, the content analysis software used in this study is limited in its ability to detect meaning in song lyrics. Latent semantic analysis may not sufficiently detect meaning in artistic texts. Linguistic Inquiry Word Count may fail to properly categorize some words, including slang, and words imbedded in idiomatic expressions.

This study only tested the factor scoring method with six songs. More research is needed to establish the validity of the method.

Study materials were limited to popular, secular, English-language songs from a 20-year period. Popular music outside of these parameters should be studied to determine whether the factor scoring method is useful for describing songs other than those similar to those sampled in this study.

Recommendations for future research. In this section all of the six methodological research questions identified at the conclusion of Chapter 2 are addressed

as elements of best practices for methodology, followed by recommendations for further study.

Best practices for experimental methodology. To improve construct validity, precise operational definitions of lyric theme content need to be determined by researchers when choosing material to represent independent variables. Using the factor scoring method devised in this study provides one way to operationally define lyric content that is consistent, easy to use, and able to make fine distinctions between types of content. As I have frequently noted, there is not just one type of violent content or prosocial content, there is a continuum of every type of content. The factor scoring method can detect and quantify themes on a continuum.

To use the factor scoring method, researchers can follow these steps: 9a) using the internal LIWC dictionary, dictionaries consistent with the language used in the songs being analyzed, or dictionaries enhanced with slang or other anomalous words used in the research sample, analyze songs with LIWC on the 24 dimensions listed in Table 10; (b) create scores on each of the six factors listed in Table 10 by multiplying the LIWC score on each dimension for a given song on each factor by the corresponding component coefficient (also shown in Table 10); and (c) add the resulting scores on each dimension together to create a score on each factor for each song.

To improve ecological validity, music and lyrics should be studied in a naturalistic way. Despite the fact that it may be expensive or difficult, music and lyrics should be professionally produced; otherwise, internal, as well as ecological validity is threatened. Researchers should not create experimental stimuli out of a patchwork of lyrics and music

that composers never meant to put together, or use music that is produced at a semi-professional level. Situations that participants usually listen to music in under normal conditions should be duplicated as closely as is practicable.

To improve internal validity, confounding elements created by music when lyrics are the independent variable need to be controlled for. As discussed at length in the literature review, there are many variations in the numerous elements that make up a given piece of music, and each of these elements has a continuum of its own effects. In order to study only the effects of different types of lyric content, music needs to remain absolutely constant across conditions. This is the only way to ensure that artifacts produced by differences in music are controlled for. This will remove the problem that comparing entirely different lyrics with entirely different music does not tease out the actual effect of the lyric alone and internal validity will be vastly improved. Researchers should employ a single unfamiliar musical selection with different sets of lyrics to represent contrasting content. To make this possible, I suggest that music and lyrics should be created for experiments by professional musicians and producers who are expert in the particular genre of music being studied. All aspects of production should be consistent with contemporary high-quality music, including composition, lyricwriting, arranging, instruments used, recording, mixing, and mastering. Although this may sound expensive or difficult, it is necessary to do this in order to obtain study materials that are truly consistent with those available in the community. Also, music commissioned specifically for experiments, consistent with a given genre, will produce music unknown to study participants; therefore,

confounds attendant to previously mass-marketed music (previous associations, identifications, preferences, memories, peer pressures, etc.) should be eliminated.

Suggestions for finding producers, engineers, writers, and musicians capable of assisting researchers include contacting professionals associated with the type of music being studied; contacting contemporary music programs such as the Berklee College of Music, California Institute of the Arts, Julliard, or the Musician's Institute; or contacting independent producers in major music centers such as Los Angeles, London, or Nashville for research assistance. Many researchers in the psychology of music are also musicians and have contacts in the music industry; for this reason, as well as for scholarly reasons, collaboration and networking among researchers studying song is critical. Researchers with a lack of experience in the music industry should be aware that due to the nature of the music business there are many semiprofessionals and lower level producers who may not be capable of producing music that sounds radio ready. Such music will not be convincing to study participants and confounds due to this could result in a lack of internal validity, so researchers should not skimp on music production and should consult with appropriate professionals when their own skills do not qualify them to make production decisions.

One simple way to handle the problem of keeping music constant is to use songs that have already been produced (ideally, prior to public release) and find artists and producers willing to create a new set of lyrics to set to the music and record these with the same vocalist as the original lyric so that a mix exact in every way (other than the new vocal) is created. This will come as close as possible to creating a perfectly parallel set of experimental material for study. This is a relatively ecologically viable method of creating

songs because many types of contemporary music do use alternate sets of lyrics (e.g., the style of reggae known as "dub," some dance music, and rap music that places new lyrics over previously existing rock or dance music). Lyrics, once written, should be content analyzed using the factor scoring method so that construct validity is good and the content of the lyrics is understood by researchers in a measurable and replicable manner.

In popular song, the lyrics that are most important are usually in the chorus or the refrain. Also, the chorus or refrain contains the central idea of a song lyric (or *hook*). One possibility for simplifying the study of popular song lyrics in experimental studies is to compare listening situations that only present these sections of songs. This is not ideal, but it is a better solution for researchers on a limited budget than using unprofessionally produced materials or comparing materials that are not musically identical.

Another suggestion is to create musical portions of study compositions taking care to compose music that is intentionally ambiguous in terms of obvious emotional cues (e.g., clear sense of major or minor key) using compositional devices such as the use of suspended and power chords in place of chords that are clearly major or minor. This will create a musical setting for lyrics that reduces the chance that the music will bias the listener toward one emotional response or another.

For each experiment, pilot studies to confirm that songs present a professional impression should be conducted. Impressions of lyrical themes can also be surveyed in pilot studies.

To avoid possible confounding conditions and minimize alternative explanations for results, vary the gender and ethnicity of experimenters when possible, use random

assignment to conditions, and control for order effects when applicable. Measure lyric comprehension and include this data in analysis.

Experiments should be carried out in an environment free from distractions, but some effort should be made to find a comfortable environment that is not too unnaturally formal (psychology labs and classrooms are not the most natural place for enjoying music). Noise-canceling headphones should be used to maximize conformity of the environment across trials and to minimize sonic bleed-through that could create confounding stimuli.

To protect participants, ethical safeguards such as those used in previous studies (Barongan & Hall, 1995; Peterson et al., 2008; Sousou, 1997) should be employed.

Experiments can be designed as either lyrical theme group comparisons suitable for analysis with ANOVA (the construct validity of the themes can be confirmed using the factor scoring method), or as explorations of relationships between lyrics scored on a continuous scale using the factor scoring method suitable for multiple regression analysis. No lyric control groups using the same music as heard by participants who hear lyrics should be used in experiments.

The general learning model (Buckley & Anderson, 2006) is a good theoretical basis to use when designing experiments; direct effects models are outdated and will not result in proper specification of how effects operate. GLM specifies that repeated short-term exposures to media result in long-term effects; therefore, the results of experiments can be discussed in terms of both short- and long-term consequences. Even so, time series and longitudinal studies of music lyrics could add considerably to the literature, which is so far lacking in such research.

Important person variables related to the study of popular music that were identified in the literature are gender, ethnicity, personality, and music preference. Controlling for individual differences should be achieved by collecting and analyzing detailed demographic and music preference information about participants, and measuring personality variables using valid and reliable personality measures such as the NEO PI-R (Costa & McCrae, 1992).

Depending on the particular dependent variables being studied, other variables should be analyzed as possible mediators, moderators, or covariates. For example, Lacourse, Claes, and Villeneuve (2001) found that heavy metal music preference is not related to suicide risk when controlling for other factors (family relationships, alienation, general suicide risk, and drug use). By carefully consulting the literature on a particular subject (e.g., suicide) researchers can determine variables that may be of use in a particular analysis.

To improve external validity, researchers should study a wide variety of populations.

To improve statistical precision, researchers should perform an a priori power analysis before conducting experiments. Every effort should be made to avoid using convenience samples of insufficient size to allow for adequate power. Non-parametric statistical methods should be considered when data that are not normally distributed are being analyzed. For example, a Mann Whitney U test is often appropriate as opposed to a t-test when strictly comparing lyric content because lyric content is not expected to take on

the characteristics of a normal distribution. Researchers should always report effect sizes with results.

To improve communication among scholars, researchers should use clear titles and keywords when publishing studies. A problem with existing literature is that the titles and keywords of some studies are not precise (videos are not "music" – lyrics are not "music"). This is not just a semantic issue; but rather, it is an important element of the overall shift toward more precision that I am urging for the study of music and lyrics. Some frequently cited journal articles (Greenfield et al., 1987) contain experiments or surveys related to videos, but are sometimes included in discussions about the literature on popular music without the distinction being made that video was studied as part of the experimental stimuli.

The importance of qualitative research. Despite the fast pace of technology and incredible advances in content analysis software and artificial intelligence, quantitative analysis is still limited in its ability to detect meaning in text and to categorize themes in song lyrics. It is possible that this will always be true. Human judgment is still vastly superior to computer-based analysis. Boon (2005) concluded that the meaning of a lyric is actually *located* in the reader; thus, the meaning of lyrics is constructed both interactively (between the listener and the lyric) and intrapersonally. Therefore, although the factor scoring method described in this dissertation is a useful tool for use in experimental research, there is much to be said for using qualitative research to study effects of music lyrics. Qualitative studies that explore individuals' life experiences with and stories about music lyrics have the potential to gather detailed and interesting information about the

psychological effects of music lyrics. Listeners have personal relationships to songs that really can't be explored as well with experimental studies as they can be with qualitative studies. Memories, motivations, behavioral effects, belief systems, impact on identity formation, and so many more psychological aspects of an individual's relationship to song can and should be studied in depth using qualitative methods.

For further study. Using the factor scoring method it would be useful to analyze large homogenous datasets of songs by type (e.g., violent) to detect factor characteristics for subtypes of thematic categories. The resulting typology of lyric content could be used as a guide to create experiments with excellent construct validity.

A principal components analysis like the one performed in this study should also be done on samples of songs from different song populations than the one used in this study (e.g., religious music) because a different set of factors may more accurately describe such music.

The problem of operationally defining independent variables in media effects studies is not specific to the issue of popular song; other forms of media could benefit from methodological studies that create sets of scales for measuring media content.

Validity studies are needed for the factor scoring method I have described. Testing of the method needs to be extended to a much larger dataset than the six songs tested in this study.

Most importantly, use of the factoring scoring method in actual experimental studies will ultimately provide the best demonstration of the validity and utility of the method.

Final summation. This study comprises a complete examination of methods used in the study of the psychological effects of music with lyrics. The literature review includes coverage of related issues in music, the psychology of music, and linguistics. The importance of having knowledge in all of these scholarly areas in order to adequately study the psychology of music with lyrics is emphasized. A new method for scoring lyric content was devised and demonstrated. I recommend the use of this new method, along with the other methodological improvements described in the discussion section, in order to improve all aspects of the validity and reliability of psychological studies of music with lyrics.

Individuals write lyrics and music in order to have an effect on listeners. Whether the writer's intent is to persuade or simply to communicate, the literature indicates that the intention of composers and lyricists to affect listeners is successful. Media education is likely to be more effective than content control in protecting individuals from possible harmful effects of violent or other noxious media (Timmerman, et al., 2008); therefore, it is important for psychologists to discover the actual effects of such media using valid methods so that media education can be designed based on solid empirical data. The two main methodological problems addressed in this study (operationally defining lyric content and controlling for music) have created barriers to the study of the psychological effects of music lyrics in the past, but by using the methods described here, researchers can study a wide variety of research questions related to any style of music and lyrics with improved clarity of results.

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APPENDIX A

Table A-1

LIWC2007 Output Variable Information[1]

Category	Abbrev	Examples	Words in category	Validity (judges)	Alpha: Binary/raw
Linguistic Processes					
Word count	wc				
words/sentence	wps				
Dictionary words	dic				
Words>6 letters	sixltr				
Total function words	funct		464		.97/.40
Total pronouns	pronoun	I, them, itself	116		.91/.38
Personal pronouns	ppron	I, them, her	70		.88/.20
1st pers singular	i	I, me, mine	12	.52	.62/.44
1st pers plural	we	We, us, our	12		.66/.47
2nd person	you	You, your, thou	20		.73/.34
3rd pers singular	shehe	She, her, him	17		.75/.52
3rd pers plural	they	They, their, they'd	10		.50/.36
Impersonal pronouns	ipron	It, it's, those	46		.78/.46
Articles	article	A, an, the	3		.14/.14
[Common verbs] a	verb	Walk, went, see	383		.97/.42
Auxiliary verbs	auxverb	Am, will, have	144		.91/.23
Past tense a	past	Went, ran, had	145	.79	.94/.75
Present tense a	present	Is, does, hear	169		.91/.74
Future tense a	future	Will, gonna	48		.75/.02
Adverbs	adverb	Very, really, quickly	69		.84/.48
Prepositions	prep	To, with, above	60		.88/.35
Conjunctions	conj	And, but, whereas	28		.70/.21
Negations	negate	No, not, never	57		.80/.28
Quantifiers	quant	Few, many, much	89		.88/.12
Numbers	number	Second, thousand	34		.87/.61
Swear words	swear	Damn, piss, fuck	53		.65/.48

[1] Pennebaker, Chung, Ireland, Gonzales & Booth (2007). Table 1: LIWC2007 output variable information. Retrieved from http://www.liwc.net/descriptiontable1.php Reprinted with permission.

Category	Abbrev	Examples	Words in category	Validity (judges)	Alpha: Binary/raw
Psychological Processes					
Social processes b	social	Mate, talk, they, child	455		.97/.59
Family	family	Daughter, husband, aunt	64	.87	.81/.65
Friends	friend	Buddy, friend, neighbor	37	.70	.53/.12
Humans	human	Adult, baby, boy	61		.86/.26
Affective processes	affect	Happy, cried, abandon	915		.97/.36
Positive emotion	posemo	Love, nice, sweet	406	.41	.97/.40
Negative emotion	negemo	Hurt, ugly, nasty	499	.31	.97/.61
Anxiety	anx	Worried, fearful, nervous	91	.38	.89/.33
Anger	anger	Hate, kill, annoyed	184	.22	.92/.55
Sadness	sad	Crying, grief, sad	101	.07	.91/.45
Cognitive processes	cogmech	cause, know, ought	730		.97/.37
Insight	insight	think, know, consider	195		.94/.51
Causation	cause	because, effect, hence	108	.44	.88/.26
Discrepancy	discrep	should, would, could	76	.21	.80/.28
Tentative	tentat	maybe, perhaps, guess	155		.87/.13
Certainty	certain	always, never	83		.85/.29
Inhibition	inhib	block, constrain, stop	111		.91/.20
Inclusive	incl	And, with, include	18		.66/.32
Exclusive	excl	But, without, exclude	17		.67/.47
Perceptual processes c	percept	Observing, heard, feeling	273		.96/.43
See	see	View, saw, seen	72		.90/.43
Hear	hear	Listen, hearing	51		.89/.37
Feel	feel	Feels, touch	75		.88/.26
Biological processes	bio	Eat, blood, pain	567	.53	.95/.53
Body	body	Cheek, hands, spit	180		.93/.45
Health	health	Clinic, flu, pill	236		.85/.38
Sexual	sexual	Horny, love, incest	96		.69/.34
Ingestion	ingest	Dish, eat, pizza	111		.86/.68
Relativity	relativ	Area, bend, exit, stop	638		.98/.51
Motion	motion	Arrive, car, go	168		.96/.41
Space	space	Down, in, thin	220		.96/.44
Time	time	End, until, season	239		.94/.58

Category	Abbrev	Examples	Words in category	Validity (judges)	Alpha: Binary/raw
Personal Concerns					
Work	work	Job, majors, xerox	327		.91/.69
Achievement	achieve	Earn, hero, win	186		.93/.37
Leisure	leisure	Cook, chat, movie	229		.88/.50
Home	home	Apartment, kitchen, family	93		.81/.57
Money	money	Audit, cash, owe	173		.90/.53
Religion	relig	Altar, church, mosque	159		.91/.53
Death	death	Bury, coffin, kill	62		.86/.40
Spoken categories					
Assent	assent	Agree, OK, yes	30		.59/.41
Nonfluencies	nonflu	Er, hm, umm	8		.28/.23
Fillers	filler	Blah, Imean, youknow	9		.63/.18

"Words in category" refers to the number of different dictionary words that make up the variable category; "Validity judges" reflect the simple correlations between judges' ratings of the category with the LIWC variable (from Pennebaker & Francis, 1996). "Alphas" refer to the Cronbach alphas for the internal reliability of the specific words within each category. The binary alphas are computed on the occurrence/non-occurrence of each dictionary word whereas the raw or uncorrected alphas are based on the percentage of use of each of the category words within the texts. All alphas were computed on a sample of 2800 randomly selected text files from our language corpus.

The LIWC dictionary generally arranges categories hierarchically. For example, all pronouns are included in the overarching category of function words. The category of pronouns is the sum of personal and impersonal pronouns. There are some exceptions to the hierarchy rules:

a. Common verbs are not included in the function word category. Similarly, common verbs (as opposed to auxiliary verbs) that are tagged by verb tense are included in the past, present, and future tense categories but not in the overall function word categories.
b. Social processes include a large group of words (originally used in LIWC2001) that denote social processes, including all non-first-person-singular personal pronouns as well as verbs that suggest human interaction (talking, sharing).
c. Perceptual processes include the entire dictionary of the Qualia category (which is a separate dictionary), which includes multiple sensory and perceptual dimensions associated with the five senses.

APPENDIX B

Table B-1

Songs in the Random Sample from the Billboard Hot 100[2]

Song Title	Recording Artist	Debut Date	Record Label
(If There Was) Any Other Way	Celine Dion	4/6/1991	Epic
(You Want To) Make A Memory	Bon Jovi	5/19/2007	Mercury Nashville/IDJMG
100% Pure Love	Crystal Waters	5/28/1994	IDJMG
1979	The Smashing Pumpkins	2/10/1996	Capitol
7 Seconds	Youssou N'Dour & Neneh Cherry	10/8/1994	WORK
A Better Love	Londonbeat	5/11/1991	MCA
A Different World	Bucky Covington	5/5/2007	Lyric Street
Addicted	Saving Abel	6/28/2008	Capitol
After The Rain	Nelson	11/3/1990	DGC
Ain't Nobody (From "Beavis And Butt-Head Do America")	LL Cool J	12/28/1996	Geffen
All Because Of You	Marques Houston Featuring Young Rome	5/7/2005	Universal Motown
All I Ask For Anymore	Trace Adkins	12/12/2009	Capitol Nashville
All Nite	Entouch Featuring Keith Sweat	1/13/1990	EEG
All The Small Things	Blink-182	12/4/1999	MCA
All Through The Night	Tone-Loc	12/14/1991	IDJMG
Always Be My Baby	Mariah Carey	4/6/1996	Columbia
American Soldier	Toby Keith	12/27/2003	DreamWorks (Nashville)
Are You Gonna Be My Girl	Jet	12/20/2003	Atlantic
At The Beginning	Richard Marx & Donna Lewis	11/8/1997	Atlantic
At The Stars	Better Than Ezra	3/13/1999	EEG
Ayo Technology	50 Cent Featuring Justin Timberlake & Timbaland	8/25/2007	Interscope
Baby, It's Tonight	Jude Cole	4/14/1990	Reprise
Back To The World	Tevin Campbell	6/22/1996	Warner Bros.
Bat Country	Avenged Sevenfold	11/12/2005	Warner Bros.
Because I Love You (The Postman Song)	Stevie B	10/6/1990	RCA
Believe	Brooks & Dunn	12/24/2005	Arista Nashville

[2] Except as noted in Appendix C, all lyrics obtained from http://www.letssingit.com

Song Title	Recording Artist	Debut Date	Record Label
Beverly Hills	Weezer	4/16/2005	Geffen
Big Daddy	Hev-D	3/8/1997	Universal
Big Girls Don't Cry	Fergie	5/5/2007	Interscope
Big Gun (From "Last Action Hero")	AC/DC	7/3/1993	EEG
Bitter Tears	INXS	4/6/1991	Atlantic
Blah Blah Blah	Ke$ha Featuring 3OH!3	1/23/2010	RMG
Break Up To Make Up	Cynthia	6/22/1991	MicMac
Breath	Breaking Benjamin	4/14/2007	Hollywood
Bridging The Gap	Nas Featuring Olu Dara	11/20/2004	Columbia
Busy Man	Billy Ray Cyrus	1/23/1999	Mercury Nashville
But It's Alright	Huey Lewis & The News	8/27/1994	EEG
Captain Save A Hoe	E-40	7/16/1994	Jive
Car Wash	Christina Aguilera Featuring Missy Elliott	9/11/2004	Geffen
Catch Me	Demi Lovato	8/8/2009	Hollywood
Chickenhead	Project Pat	3/3/2001	Loud/Columbia
Citizen/Soldier	3 Doors Down	1/12/2008	Universal Republic
Closer	Remedy	3/27/1993	Hollywood
Cold	Crossfade	8/7/2004	Columbia
Colour Of Love	Amber	1/18/1997	Tommy Boy
Come As You Are	Nirvana	3/21/1992	DGC
Come Clean	Jeru The Damaja	1/29/1994	FFRR
Come See Me	112	11/9/1996	Arista
Come With Me	Keith Sweat (Featuring Ronald Isley)	6/14/1997	EEG
Could I Have This Kiss Forever	Whitney Houston & Enrique Iglesias	6/17/2000	Arista/Interscope
Cry For Help	Rick Astley	2/16/1991	RCA
Dancin'	Guy	12/18/1999	MCA
Dazzey Duks	Duice	1/9/1993	Bellmark
Delicious	Pure Sugar	8/8/1998	Geffen
Desert Rose	Sting Featuring Cheb Mami	5/13/2000	Interscope
Dirty Dawg	NKOTB	1/22/1994	Columbia
Doesn't Really Matter	Janet	6/17/2000	IDJMG
Don't Talk Just Kiss	Right Said Fred	4/18/1992	Charisma
Don't Tell Me	Avril Lavigne	4/3/2004	RMG
Down With The King	Run-D.M.C.	3/20/1993	Profile
Dreamlover	Mariah Carey	8/7/1993	Columbia
Drive	Incubus	2/17/2001	Epic

Song Title	Recording Artist	Debut Date	Record Label
Drive	R.E.M.	10/31/1992	Warner Bros.
El Trago (The Drink)	2 In A Room	4/30/1994	Cutting
Energy	Natalie Featuring Baby Bash	6/18/2005	UMRG
Everybody	Keith Urban	10/20/2007	Capitol Nashville
Everybody Everybody	Black Box	8/4/1990	RCA
Fall To Pieces	Velvet Revolver	9/25/2004	RMG
Famous In A Small Town	Miranda Lambert	10/6/2007	Columbia (Nashville)
Feel So High	Des'ree	4/1/1995	550 Music
Feelin' It	Jay-Z	5/3/1997	Priority
Feenin'	Jodeci	3/12/1994	MCA
Fergalicious	Fergie	10/7/2006	Interscope
Fireman	Lil Wayne	11/19/2005	Universal Motown
Flap Your Wings	Nelly	9/4/2004	UMRG
Float On	Modest Mouse	5/29/2004	Epic
For You I Will (Confidence)	Teddy Geiger	2/18/2006	Columbia
For Your Love	Stevie Wonder	3/4/1995	Motown
Forever	Kiss	2/3/1990	IDJMG
Found Out About You	Gin Blossoms	11/20/1993	A&M
Freak On A Leash (Unplugged)	Korn Featuring Amy Lee	3/17/2007	Capitol
Free Yourself	Fantasia	4/30/2005	RMG
From This Moment On	Shania Twain	12/5/1998	Mercury Nashville
Georgia On My Mind	Michael Bolton	8/25/1990	Columbia
Get It Shawty	Lloyd	3/31/2007	Universal Motown
Get On Your Boots	U2	2/7/2009	Interscope
Give It To Me	Timbaland Featuring Nelly Furtado & Justin Timberlake	2/24/2007	Interscope
Give It Up	Wilson Phillips	8/8/1992	EMI
Good Ol' Days	Levert	3/20/1993	Atlantic
Got Ur Self A...	Nas	12/15/2001	Columbia
Groovin'	UB40	11/23/1991	Capitol
Halfway Gone	Lifehouse	12/26/2009	Interscope
Headfirst Slide Into Cooperstown On A Bad Bet	Fall Out Boy	10/25/2008	IDJMG
Heart Of Stone	Cher	2/10/1990	Geffen
Helluva	Brotherhood Creed	4/18/1992	MCA
Hey Leonardo (She Likes Me For Me)	Blessid Union Of Souls	6/12/1999	V2
Hip Hop Ride	Da Youngsta's	9/24/1994	EEG

Song Title	Recording Artist	Debut Date	Record Label
Hippychick	Soho	9/8/1990	EEG
Hold On To Me	John Michael Montgomery	12/5/1998	Atlantic (Nashville)
Holy Water	Big & Rich	1/1/2005	WRN
Hot Revolver	Lil Wayne	4/4/2009	Universal Motown
How Low	Ludacris	12/26/2009	IDJMG
I Don't Know	Michael Morales	12/9/1989	Polydor
I Don't Wanna Cry	Mariah Carey	4/6/1991	Columbia
I Don't Want To Be	Gavin DeGraw	10/23/2004	RMG
I Know	Dionne Farris	1/28/1995	Columbia
I Like It	Jomanda	7/10/1993	Atlantic
I Like The Way (The Kissing Game)	Hi-Five	2/23/1991	RCA
I Luv Your Girl	The-Dream	5/10/2008	IDJMG
I Miss You	N2U	12/3/1994	Arista
I Never Knew Love	Doug Stone	1/1/1994	Epic
I Want To Come Over	Melissa Etheridge	2/17/1996	IDJMG
I Want You	Savage Garden	3/1/1997	Columbia
I Want You Back	'N Sync	3/7/1998	RCA
I Wish	Skee-Lo	4/29/1995	Scotti Bros.
I Wish It Would Rain Down	Phil Collins	2/3/1990	Atlantic
I Wish The Phone Would Ring	Expose	10/31/1992	Arista
I'd Rather Be With You	Joshua Radin	9/27/2008	JLG
I'll Never Let You Go	Steelheart	3/16/1991	MCA
I'll Wait For You	Joe Nichols	2/17/2007	Universal South
I'm A Hustla	Cassidy	3/19/2005	RMG
I'm Glad	Jennifer Lopez	5/3/2003	Epic
I've Got A Lot To Learn About Love	The Storm	10/26/1991	Atlantic
If This Isn't Love	Jennifer Hudson	3/14/2009	RMG
If You Go Away	NKOTB	2/22/1992	Columbia
If You Love Me	Mint Condition	11/6/1999	EEG
Imagination	Tamia	3/21/1998	Warner Bros.
Imitation Of Life	R.E.M.	5/26/2001	Warner Bros.
Imma Be	The Black Eyed Peas	6/6/2009	Interscope
Inside Out	Eve 6	12/5/1998	RCA
Insomnia	Faithless	3/29/1997	Arista
It Ain't My Fault 1 & 2	Silkk The Shocker Featuring Mystikal	3/6/1999	Priority
It's All Coming Back To Me Now	Celine Dion	8/17/1996	550 Music
It's Your Life	Francesca Battistelli	12/12/2009	Word-Curb
Jealous	Gene Loves Jezebel	8/18/1990	Geffen
Just Let Me Be In Love	Tracy Byrd	1/12/2002	RCA Nashville
Keep Warm	Jinny	9/14/1991	Next Plateau

Song Title	Recording Artist	Debut Date	Record Label
Knockin' Boots	Candyman	9/1/1990	Epic
Lady	Mista	1/4/1997	EEG
Larger Than Life	Backstreet Boys	9/18/1999	Jive
Lean On Me	Sheryl Crow, Kid Rock & Keith Urban	2/13/2010	MTV Networks
Let Me Hold You	Bow Wow Featuring Omarion	5/28/2005	Columbia
Let Your Soul Be Your Pilot	Sting	3/2/1996	A&M
Let's Ride	Game	12/2/2006	Geffen
Life In A Northern Town	Sugarland Featuring Little Big Town & Jake Owen	7/12/2008	Mercury Nashville
Lifestyles Of The Rich And Shameless	Lost Boyz	5/13/1995	MCA
Lithium	Nirvana	8/8/1992	Interscope
LOL :-)	Trey Songz Featuring Gucci Mane & Soulja Boy Tell'em	9/19/2009	Atlantic
Long Road To Ruin	Foo Fighters	2/2/2008	RMG
Love Lockdown	Kanye West	10/4/2008	IDJMG
Love Me For Life	Stevie B	2/3/1990	LMR
Love Song	311	5/1/2004	Zomba
Love U 4 Life	Jodeci	11/4/1995	MCA
LoveGame	Lady Gaga	3/21/2009	Interscope
Low	Flo Rida Featuring T-Pain	11/10/2007	Atlantic
Magic Stick	Lil' Kim Featuring 50 Cent	4/26/2003	Atlantic
Make It Clap	Busta Rhymes Featuring Spliff Star	11/9/2002	RMG
Mamma Mia	Meryl Streep	8/9/2008	Decca
Man To Man	Gary Allan	1/4/2003	MCA Nashville
Maria	TKA	4/4/1992	Tommy Boy
Me Against The Music	Britney Spears Featuring Madonna	10/25/2003	Zomba
Mental Picture	Jon Secada	11/26/1994	EMI
Million Dollar Bill	Whitney Houston	9/19/2009	RMG
Miracle	Whitney Houston	4/13/1991	Arista
Missing You (From "Set It Off")	Brandy, Tamia, Gladys Knight & Chaka Khan	8/24/1996	EEG
Mississippi Girl	Faith Hill	6/11/2005	WRN
Mother	Danzig	2/12/1994	Reprise
Music Box	Eminem	1/9/2010	Interscope
My Body	LSG	11/1/1997	EEG
My Boo	Usher And Alicia Keys	9/11/2004	Zomba

Song Title	Recording Artist	Debut Date	Record Label
My City Of Ruins (Live From The Kennedy Center Honors)	Eddie Vedder	2/13/2010	Monkeywrench
My Heart Will Go On	Celine Dion	2/28/1998	550 Music
My Hood	Young Jeezy	1/7/2006	IDJMG
My Immortal	Evanescence	1/10/2004	Wind-up
My Maria	Brooks & Dunn	4/27/1996	Arista
My Sister	Reba McEntire	7/9/2005	MCA Nashville
Naggin	Ying Yang Twins	9/27/2003	TVT
Never Ever	All Saints	7/25/1998	IDJMG
Never Gonna Be Alone	Nickelback	12/6/2008	RRP
No Letting Go	Wayne Wonder	1/11/2003	Atlantic
No Son Of Mine	Genesis	11/2/1991	Atlantic
No Tengo Dinero	Los Umbrellos	8/30/1997	Capitol
Nobody Wants To Be Lonely	Ricky Martin Duet With Christina Aguilera	1/27/2001	Columbia
None Of Ur Friends Business	Ginuwine	12/11/1999	550-Work
Not A Dry Eye In The House	Meat Loaf	2/17/1996	MCA
Nothin' But The Cavi Hit (From "Rhyme & Reason")	Mack 10 & Tha Dogg Pound	12/14/1996	Priority
Nothin' On You	B.o.B Featuring Bruno Mars	2/13/2010	Atlantic
Oh	Ciara Featuring Ludacris	3/26/2005	Zomba
One	Adam Lambert	6/6/2009	19
One	Creed	2/27/1999	Wind-up
One Step At A Time	Jordin Sparks	7/12/2008	JLG
Only Love (The Ballad Of Sleeping Beauty)	Sophie B. Hawkins	3/2/1996	Columbia
Only My Heart Talkin'	Alice Cooper	4/28/1990	Epic
Open My Heart	Yolanda Adams	8/26/2000	EEG
Over And Over	Nelly Featuring Tim McGraw	10/16/2004	UMRG
Paparazzi	Lady Gaga	9/12/2009	Interscope
Peacekeeper	Fleetwood Mac	3/29/2003	Reprise
Phenomenon	LL Cool J	11/1/1997	IDJMG
Please	The Kinleys	10/4/1997	Epic (Nashville)
Radar	Britney Spears	8/29/2009	JLG
Raining On Sunday	Keith Urban	3/15/2003	Capitol Nashville
Rapture (Tastes So Sweet)	iio	2/16/2002	UMRG
Ray Of Light	Madonna	7/11/1998	Warner Bros.
Restless Heart	Peter Cetera	7/11/1992	Warner Bros.
Rich Girl	Gwen Stefani Featuring Eve	12/25/2004	Interscope
Right Down To It	Damian Dame	12/14/1991	Arista

Song Title	Recording Artist	Debut Date	Record Label
Right Here	Staind	6/25/2005	Atlantic
Right On The Money	Alan Jackson	12/5/1998	Arista Nashville
Roun' The Globe	Nappy Roots	8/30/2003	Atlantic
Run	Collective Soul	3/13/1999	Atlantic
Selfish	Slum Village Featuring Kanye West & John Legend	5/22/2004	Capitol
Sex Me (Parts I & II)	R. Kelly	10/30/1993	Jive
Sexy Chick	David Guetta Featuring Akon	8/15/2009	Capitol
Sexy Movimiento	Wisin & Yandel	11/24/2007	Machete
She Got Her Own	Ne-Yo Featuring Jamie Foxx & Fabolous	12/27/2008	IDJMG
She's So High	Tal Bachman	6/19/1999	Columbia
Shoop Shoop (Never Stop Givin' You Love)	Michael Cooper	3/13/1993	Reprise
Simple Life	Elton John	2/27/1993	MCA
Sleeping In My Car	Roxette	7/2/1994	EMI
Slow Dance (Hey Mr. DJ)	R. Kelly & Public Announcement	8/22/1992	Jive
Slow Motion	Color Me Badd	5/9/1992	Giant
Slow Motion	Juvenile Featuring Soulja Slim	5/1/2004	UMRG
Smooth	Santana Featuring Rob Thomas	7/31/1999	Arista
So Fly	NB Ridaz Featuring Gemini	6/26/2004	Upstairs
Soak Up The Sun	Sheryl Crow	4/13/2002	Interscope
Sometimes She Cries	Warrant	1/6/1990	Columbia
Sometimes You Can't Make It On Your Own	U2	4/16/2005	Interscope
Stacy's Mom	Fountains Of Wayne	10/11/2003	EMC
Stars	Switchfoot	10/1/2005	Columbia
Stay (I Missed You) (From "Reality Bites")	Lisa Loeb & Nine Stories	5/7/1994	RCA
Step By Step (From "The Preacher's Wife")	Whitney Houston	3/15/1997	Arista
Stricken	Disturbed	10/8/2005	Reprise
Stronger Woman	Jewel	2/23/2008	Valory
Sugar, We're Goin' Down	Fall Out Boy	7/2/2005	IDJMG
Summer Bunnies	R. Kelly	8/20/1994	Jive
Summertime In The LBC (From "The Show")	The Dove Shack	8/12/1995	IDJMG
Sunday Morning	Earth, Wind & Fire	8/28/1993	Reprise
Superstar	Taylor Swift	11/14/2009	Big Machine

Song Title	Recording Artist	Debut Date	Record Label
Swag Surfin'	F.L.Y. (Fast Life Yungstaz)	5/23/2009	IDJMG
Sweet Surrender	Sarah McLachlan	2/14/1998	Arista
Take You Out	Luther Vandross	7/21/2001	RMG
Take Your Time (Do It Right)	Max-A-Million	7/8/1995	Zoo
Tender Lover	Babyface	11/18/1989	Epic
That's Not Her Style	Billy Joel	8/4/1990	Columbia
The Anthem	Good Charlotte	3/29/2003	Epic
The Choice Is Yours	Black Sheep	2/29/1992	IDJMG
The Crying Game (From "The Crying Game")	Boy George	3/13/1993	EMI
The Girl I Used To Know	Brother Beyond	6/23/1990	EMI
The Grand Tour	Aaron Neville	10/9/1993	A&M
The One	Mary J. Blige Featuring Drake	8/8/2009	Interscope
The Other Side	Aerosmith	6/23/1990	Geffen
The Party Continues	JD Featuring Da Brat	3/7/1998	Columbia
The Rhythm Of The Night	Corona	11/12/1994	EEG
The Right Kinda Lover	Patti LaBelle	7/2/1994	MCA
The Right Time (From "Four Weddings And A Funeral")	I To I	4/16/1994	IDJMG
The Things That You Do	Gina Thompson	7/13/1996	IDJMG
There She Goes	The La's	7/20/1991	IDJMG
These Days	Rascal Flatts	10/5/2002	Lyric Street
They Don't Care About Us	Michael Jackson	6/8/1996	Epic
Things Just Ain't The Same	Deborah Cox	7/5/1997	Arista
Think	Information Society	10/6/1990	Reprise
Thinkin' Bout It	Gerald Levert	9/5/1998	EEG
This Is How A Heart Breaks	Rob Thomas	7/16/2005	Atlantic
This Love	Maroon 5	2/14/2004	RMG
Top Back	T.I.	12/23/2006	Atlantic
Touch	Omarion	6/25/2005	Epic
Touch Myself (From "Fled")	T-Boz	8/10/1996	Arista
Tough Little Boys	Gary Allan	8/23/2003	MCA Nashville
Turn The Beat Around (From "The Specialist")	Gloria Estefan	9/24/1994	Epic
U + Ur Hand	Pink	1/13/2007	Zomba
U Got It Bad	Usher	9/22/2001	Arista
U.N.I.T.Y.	Queen Latifah	11/27/1993	Motown
Umma Do Me	Rocko	2/23/2008	IDJMG
Understanding	Xscape	12/25/1993	Columbia
Up Jumps Da Boogie	Magoo And Timbaland	7/19/1997	Atlantic
Vitamin R (Leading Us Along)	Chevelle	11/20/2004	Epic
Walkin' On The Moon	The-Dream Featuring Kanye West	6/13/2009	IDJMG

Song Title	Recording Artist	Debut Date	Record Label
Wanted	Jessie James	5/30/2009	IDJMG
We Didn't Start The Fire	Billy Joel	10/14/1989	Columbia
We Getz Busy	Illegal	10/23/1993	RMG
We Like To Party!	Vengaboys	2/13/1999	Strictly Rhythm
We Rock	Cast Of Camp Rock	7/5/2008	Walt Disney
Welcome To The World	Kevin Rudolf Featuring Rick Ross	5/2/2009	Universal Republic
Wetter (Calling You Daddy)	Twista Featuring Erika Shevon	6/13/2009	Capitol
What Are You Doing With A Fool Like Me	Joe Cocker	6/23/1990	Capitol
What Was I Thinkin'	Dierks Bentley	6/21/2003	Capitol Nashville
When A Man Loves A Woman	Michael Bolton	10/12/1991	Columbia
When God-Fearin' Women Get The Blues	Martina McBride	9/15/2001	RCA Nashville
When The Last Time	Clipse	9/14/2002	Arista
Where I Wanna Be	Damizza Presents Shade Sheist Featuring Nate Dogg & Kurupt	11/11/2000	London-Sire
Who Needs Pictures	Brad Paisley	6/19/1999	Arista Nashville
Who's That Girl?	Eve	2/17/2001	Interscope
Who's The Man? (From "Who's The Man")	House Of Pain	5/29/1993	Tommy Boy
Whoomp! (There It Went)	Tag Team, Mickey, Minnie, And Goofy	1/14/1995	Bellmark
With Love	Hilary Duff	3/31/2007	Hollywood
You Are The Music In Me	Zac Efron & Vanessa Anne Hudgens	9/1/2007	Walt Disney
You Bring Me Up	K-Ci & JoJo	6/14/1997	MCA
You Let Your Heart Go Too Fast	Spin Doctors	7/16/1994	Epic
You're Gonna Miss This	Trace Adkins	2/16/2008	Capitol Nashville
Youth Of The Nation	P.O.D.	2/9/2002	Atlantic

APPENDIX C

Table C-1

Additional Lyric Sources

Song Title	**Lyric Source**
“I Don't Know”	www.xtralyrics.com
“The Girl I Used To Know” and “What Are You Doing With A Fool Like Me”	www.top40db.com
“Keep Warm”	www.sweetslyrics.com
“Nothin' But The Cavi Hit” (From "Rhyme & Reason"), “The Right Time” (From "Four Weddings And A Funeral"), and “Where I Wanna Be”	www.stlyrics.com
“Umma Do Me”	www.smartlyrics.com
“Thinkin' Bout It”	www.sing365.com
“All Nite”	www.rnbhaven.com
“Hip Hop Ride”	www.musicsonglyrics.com
“Baby, It's Tonight” and “I've Got A Lot To Learn About Love”	www.mp3lyrics.org
“The Right Kinda Lover”	www.metrolyrics.com
“Jealous”	www.lyricstime.com
“Take Your Time (Do It Right)”	www.lyricsondemand.com
“Break Up To Make Up”, “Drive”, “I Like It”, and “I Wish The Phone Would Ring”	www.lyricsmode.com
“All Through The Night” and “We Getz Busy”	www.lyricsmania.com
“Come See Me”	www.lyricsdepot.com
“The Rhythm Of The Night”	www.lyrics.wikia.com
“The Things That You Do”	www.lyrics.astraweb.com
“Cold”	www.anysonglyrics.com
“Good Ol' Days” and “Delicious”	lyric transcribed from recording

APPENDIX D

Table D-1

Songs in the Latent Semantic Analysis

Factor	5 Lowest Scores	5 Scores Closest to Mean	5 Highest Scores
1	Drive (by Incubus)	At the Beginning	The Right Kinda Lover
	Halfway Gone	Feel So High	I Like The Way
	Run	Youth of the Nation	Better Love
	Fall to Pieces	I Know	Sunday Morning
	There She Goes	All the Small Things	With Love
2	Desert Rose	Sometimes She Cries	Nothin' On You
	Slow Dance	Helluva	Things Just Ain't The Same
	Run	Knockin' Boots	Understanding
	Sunday Morning	Come Clean	I Want You
	Oh	All Through The Night	(If There Was) Any Other Way
3	I'll Wait For You	Run	Captain Save a Hoe
	Headfirst Slide…	Busy Man	We Getz Busy
	You Are The Music	I Want You	Feelin' It
	No Son of Mine	Imagination	Freak on a Leash
	Open My Heart	The Things That You Do	Let's Ride (Strip Club)
4	The Right Time	Who's That Girl	Nobody Wants to be Lonely
	Could I Have This Kiss…	Miracle	Cry for Help
	For Your Love	Only My Heart Talking	I Miss You
	Halfway Gone	Summer Bunnies	Sometimes She Cries
	Mississippi Girl	Captain Save a Hoe	Low
5	Cold	Headfirst Slide…	Famous in a Small Town
	Run	Bet	A Different World
	Drive	If You Go Away	Tough Little Boys
	At the Beginning	I Don't Want to Be	I'll Wait For You
	Fall to Pieces	Baby, It's Tonight	Busy Man
6	You Bring Me Up	Knockin' Boots	Better Love
	But It's Alright	Where I Wanna Be	Heart of Stone
	Touch Myself	Let Me Hold You	I Don't Wanna Be
	Drive	Youth of the Nation	Let Your Soul Be Your Pilot
	Feenin'	Step by Step	Long Road to Ruin