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They Like to Move It (So Let Them)

Using Pump-Up Music
to Energize Students

Music is an outburst of the soul.

—Frederick Delius

In music the passions enjoy themselves.

—Friedrich Nietzsche

What It Is

Just as there are times in any classroom when students are overly energetic, there are also times when they are sleepy, lethargic, or even apathetic. At such times, it can feel like you're working your tail off just to get students to pay attention. The answer to your problem may be as close as your iPod or CD player. The right kind of music has the power to change such states within minutes, sometimes even seconds. Adding some up-tempo pump-up music into the environment, especially if combined with some vigorous movement, gives students a jolt of adrenaline and adds instant energy to the classroom—energy that you can then redirect to a learning task.



Why It Works

We've all experienced first-hand the stimulation of a fast-paced, rousing tune. But the question is *why* we respond the way we do, and the answer to that question is, just as it was with feel-good and calming music, "it's complicated."

Entrainment, Arousal, and the Orienting Effect

To begin to tease out the different factors that contribute to the stimulating effect of pump-up music, let's flash back to the previous chapter, where we talked about entrainment, and the natural tendency of human beings to synchronize physiological rhythms such as heart beat and breathing to music.

What is it about music that causes people to respond physically? Is it the beat? The mode? The rising and falling of the pitch? Research has found that the *tempo* of the music is the most important factor driving entrainment. Sometimes we entrain to music consciously. For example, people listening to music while exercising tend to match their movements to the beat of the music and use it as a pacing mechanism,¹ which allows them to work harder and leads to more

satisfying and enjoyable workouts.² But a person doesn't have to be working out to entrain to a beat. Research has shown that the respiration of stationary listeners will entrain to a steady beat, even if no music is present. On the other hand, a bare beat does not affect mood; that takes other musical elements—mode, melody, and harmony (Khalfa, Roy, Rainville, Dalla Bella, & Peretz, 2008).

In the previous chapter, we saw that if the beat of the music is below a person's current heart rate, that person's heart rate and respiration will tend to slow down in an attempt to match the beat. And we might reasonably expect the converse to be true. Research certainly shows that music with a faster beat than the listener's heart rate causes *some* physiological factors to increase in an attempt to entrain with the music. For example, up-tempo music has been shown to cause an arousal effect that manifests itself as increases in skin conductance, blood pressure, and respiration—especially if the fast beat is reinforced by other musical characteristics deemed “emotionally powerful” such as those discussed in Chapter 2.³

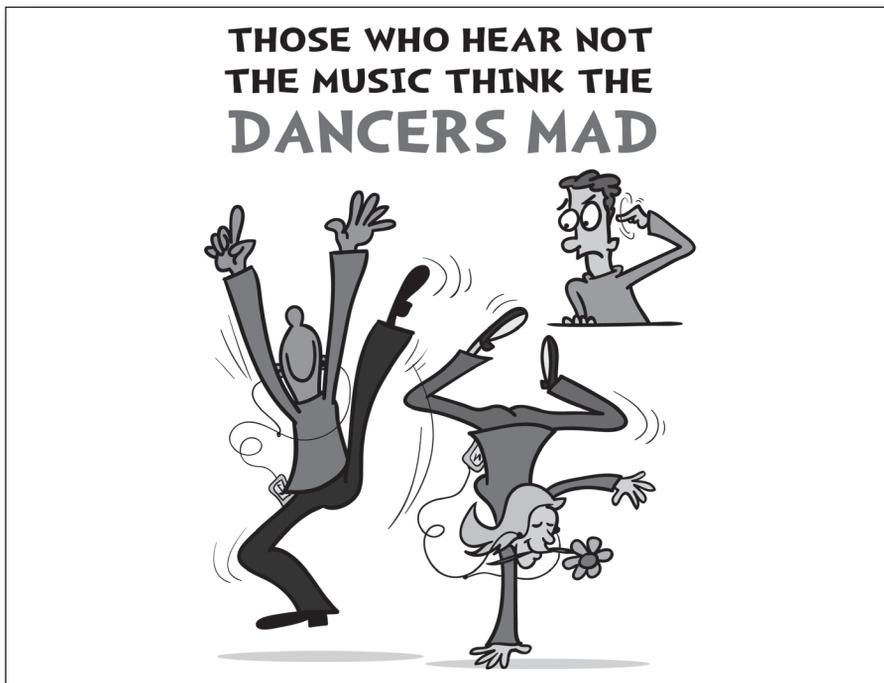
However, this is not always true of heart rate. One would think, following our entrainment discussion in the previous chapter, that music with a tempo faster than the resting human heart rate (60 to 80 bpm) would cause heart rate to speed up. In fact, while some studies have demonstrated heart rate acceleration in response to stimulating music, others have actually shown *deceleration*, while still others have shown no change.

Why would our heart rate sometimes drop when listening to up-tempo music? After a great deal of discussion in the research literature, a consensus seems to be emerging that the drop in heart rate sometimes observed in subjects listening to up-tempo music has to do with something called the *orienting response*. When first orienting and attending to a new sound in the environment (such as a song), a variety of automatic, temporary physiological changes take place, one of which is a reduced heart rate. These changes appear to be designed to enhance sensory processing of the stimulus (more than likely, to assess the situation for any sign of danger). If the sound disappears, or if it continues in a repetitive fashion (such as a steady beat in a song), the listener habituates to the situation, and the orienting response disappears.⁴ At this point, the arousal effect of the music may override the initial deceleration and cause heart rate to return to, or even rise above, baseline. This conflict between the orienting response and the arousal effect appears to explain why some studies show heart rate deceleration, some show acceleration, and some show no change in heart rate in response to stimulating music. Overall, however (even if heart rate decelerates), stimulating music causes a variety of physiological changes that indicate arousal.

Movement Accentuates Arousal

So yes, stimulating, up-tempo music does clearly cause arousal, as measured by respiration, skin conductance, and blood pressure, along with less consistent effects on listeners' heart rates. But playing stimulating music isn't the only way to energize students. Another powerful way to wake up their bodies and minds is to get them up and moving around the room, as movement leads to the same physiological arousal effects as stimulating music. And the combination of physical movement *plus* pump-up music is a surefire way to energize sluggish students.

This connection between movement and music actually begins very early in life. Research has shown that, even as infants, we prefer to move to a beat. In fact, if there is sound in the environment but no clearly discernible beat, infants will *impose* a structure on the sound and move to that imposed beat!⁵ And not only do we feel the need to move to music, we also clearly *enjoy* doing so, especially if the music is faster and/or louder.⁶ When it comes to combining music with exercise, studies have shown that using slower-paced music while doing submaximal exercise (walking, slow jogging, etc.) helps increase endurance,⁷ while using faster-paced music while doing more intense exercise helps to raise heart rate and respiration to meet the challenge. It appears that listening to music that matches our movement goals is a highly effective strategy.⁸



INSIDE A CLASSROOM

Energizing Students for Learning

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"I think it's very important to periodically create a state change that energizes students' bodies, while simultaneously altering their cognitive dispositions. The resulting release of positive neurotransmitters enhances the students' disposition to learn and to engage with the task at hand.

"To do this, I first set a large visual, computer-based timer for 90 seconds on the overhead LCD projector. I then give a brief instruction to take 11 to 15 large steps in any direction and stop. Next, I ask each student to take their pulse to determine their resting heart rate. I then ask the students to immediately begin a variety of cardiovascular exercises or movements such as jumping jacks, kangaroo hops, lunges, or in-place pogo jumps, which are to be conducted at a maximum level of physical exertion upon hearing the music. I encourage students to create their own form of physical activity. They are to maintain this movement until the timer expires and the music stops. At this time, each student recalculates his or her pulse. Upon conclusion, I typically give students a glucose booster such as a gummy bear, jelly bean, or M&M when returning to their desks.

"Prior to implementing this activity, I primarily relied on using an upbeat song, 120 beats per minute or higher, while the students walked around the room to a specific instruction such as touching 25 specifically colored objects or high-fiving as many people as possible before returning to their seats. The results were consistently positive. Yet, I was still interested in 'raising the bar' to achieve even more dramatic physiological effects that would significantly change students' learning states as supported by the latest cognitive research. Since introducing this musically based aerobic activity, I have observed the following benefits: (1) reduction in off-task behavior; (2) a heightened level of cooperation; (3) improved mood such as elevated calmness or alertness; and (4) extended periods of increased ability to stay mentally engaged."

Advice to Teachers: "I believe any educator, trainer, or teaching professional should seriously consider the enormous benefits of a musically driven learning atmosphere. The research is clear that utilizing the appropriate beats per minute and matching it with the corresponding physical or mental task can have beneficial physiological effects that can improve a learner's overall mood. Enhanced mood levels can lead to increased cognitive performance, elevated levels of cooperation, and stronger feelings of joy and excitement about being in the learning environment, and the novelty of the activity creates a sense of uniqueness about being in your classroom that permeates the learner's disposition toward being in school—something that's becoming rarer and rarer in today's schools. It creates a win-win situation for both teachers and students."

Suggested Songs: "Unchained," by Van Halen; "Jerk It Out," by the Caesars; "Wanna Be Starting Something," by Michael Jackson.

Extra Adrenaline = Better Learning

Increased heart rate and respiration are not the only physiological changes that take place when listening to pump-up music (or moving); they are just the most easily noticed. Less obvious is the fact that for the heart rate to speed up, extra adrenaline must be released into the bloodstream. This is important to teachers because adrenaline (in moderate amounts) also has positive effects on learning.

For one thing, extra adrenaline equals more arousal, and more arousal equals better attention. And, as molecular biologist John Medina (2008) points out in his book, *Brain Rules: 12 Principles for Surviving and Thriving at Work, Home, and School*, “The more attention the brain pays to a given stimulus, the more elaborately the information will be encoded—and retained” (p. 74). A number of research studies support this conclusion by demonstrating that up-tempo music leads to higher arousal, and that this higher level of arousal (especially if augmented by positive mood) leads to better cognitive performance.⁹

In addition, extra adrenaline in the system has been shown to act as a long-term memory “fixative.” That is, when more adrenaline is present in the body and brain, we more easily encode information in the hippocampus, the part of the brain primarily responsible for long-term memory storage.¹⁰ Bottom line? When we have extra adrenaline in our systems, we’re more alert, we pay better attention, and we learn more easily. And having up-tempo music in the learning environment is one of the easiest ways to start this positive cascade of events leading to learning.

Characteristics of Pump-Up Music

Most people believe they know pump-up music when they hear it, and they are probably right. However, let’s try to define this type of music as clearly as we can to differentiate it from the other types of music discussed in this book. Here are some general guidelines to support your search for stimulating music to use in your classroom:

- **Tempo:** Pump-up music needs to fall in the 120- to 160-beat-per-minute range—meaning, pretty fast. Think “Bandstand Boogie” by Les Elgart. This is not to say that music that is a little slower (say, 80 to 120 bpm) can’t also have a stimulating effect; it can, and in fact, we will talk about that tempo of music in a later chapter. It is also important to point out that some music is probably *too fast* for use in the classroom—even as

pump-up music. Once you get above about 160 bpm, you may be engendering a frenzied state in your students. While a little extra adrenaline in the system is good for learning, too much can lead to a lack of focus.

- **Instrumentation:** Whereas the music used for calming students often uses minimal instrumentation, music used to stimulate students is just the opposite. Pump-up music usually employs rich instrumentation and attention-getting instruments like trumpets, saxophones, and electric guitars.

Music is the shorthand of emotion.

—Leo Nikolaevich

- **Exciting Emotional Tone:** Pump-up music is generally exciting, and while it's hard to define *exciting* exactly, some other adjectives that might fit the bill include *soaring*, *dramatic*, *passionate*, *vigorous*, *robust*, or *majestic* (Hevner, 1936a).
- **Beat:** Pump-up music usually has a strong, pronounced beat.
- **Volume:** Pump-up music works best when played at a medium-loud volume. Obviously, students must be able to hear the music for it to have its intended arousing effect, and a little extra volume adds to that effect.
- **Vocal or Instrumental:** Since you will be playing pump-up music during transitions, it doesn't matter if the music has lyrics or not. There is a great deal of excellent pump-up music available of both types.
- **Overlap With Feel-Good Music:** Pump-up music and feel-good music often overlap, and this is an important point for teachers to be aware of. A song can be a feel-good song for a number of reasons (see the characteristics listed in Chapter 2) without being arousing. For example, there are many good feel-good songs with tempi well below 120 beats per minute (some of our favorite feel-good tunes are ballads). These songs can still be somewhat arousing if other characteristics are present (a strong beat, attention-getting instrumentation, played at a loud volume, for example), but if the goal is to energize students, such songs may not do the trick, even though they might serve to raise students' moods. On the other hand, not all pump-up music is going to necessarily improve mood. A song may be up-tempo and arousing without

necessarily being enjoyable. Having said all of this, there are many songs that have characteristics of both feel-good and pump-up music, which is great because, if your goal is to energize your students, it can't be a bad thing to use the music to put them in a good mood at the same time. Two birds, one stone, and all that.

When a number of these characteristics are present in a song, the chances are good that it will work well to energize your students. Fortunately, there is a great deal of music available in almost every genre that will serve this purpose.

How to Use It

First, identify the best times to use it. Are there certain predictable times in your teaching day or week when your students tend to be sleepy, listless, or lethargic? Monday mornings or after lunch are usually good candidates, as are days when the weather is gloomy. You will know what those times are in your own classroom. The trick, as always, is to anticipate these situations and be prepared.

At the Beginning of Class

As with feel-good music and calming music, the best times to use pump-up music are during transitions. For example, if you know that your students tend to drag into class first thing in the morning or at the beginning of specific class periods, you can combat this problem by having some pump-up music cued up and ready to go as students come in. Play it at medium to medium-loud volume as students enter the room. You will notice that some students immediately brighten up and start bopping to the music. Some of the more reserved students may look at the more energetic ones and laugh, or at least smile, and perhaps begin to bob their heads or tap a foot to the beat. It's all good, and helps to add energy to the classroom—energy that can then be used for learning.

Within a Class Period

You can also use pump-up music during those smaller transitions during class time (getting materials out, putting things away, switching from individual seat work to group work). When you play pump-up music during these transitions, you will notice that students

move more quickly about the room instead of dragging. Transitions get done more quickly as a result, saving you instructional time.

You can even ratchet up the management potential of this use of music by using the same up-tempo song for a particular kind of transition for a period of time. Tell the students that you are going to play forty-five seconds (or whatever is appropriate) of the song, and that they need to be done with the transition and ready for the next activity by the end of that piece of the song. You can use the chorus or any piece of the song, but use the same piece each time so that students can anticipate when the piece is getting ready to end. You will notice that your students will speed up even more just toward the end of the selection so they can be finished transitioning before the song ends.

At the End of Class

And don't forget the final transition, at the end of a class or the end of the school day. Playing up-tempo music as students leave sends them out on a positive, energetic note. When they walk toward your class the next day, they will remember that feeling, and they will bring that energy back with them for the start of a new day of learning.

Again, don't use this music in the learning environment while you are actually teaching. You may be getting tired of hearing us say that, but we feel that we can't stress this point too much. Having music on while doing direct instruction would only interfere with learning, not enhance it, which is your goal. You *can* play music while students read or write, or while they participate in any number of other individual or group processing activities, and that use of music (background music) is the subject of the next two chapters.

Guidelines for Using Pump-Up Music

- Avoid the genre trap. When most people think about pump-up music, certain genres come to mind immediately—primarily rock and roll, hard rock, hip-hop, and dance music. But you can find at least some songs that fit the characteristics described in this chapter in just about any musical genre. While genres such as hard rock and dance music contain a high percentage of pump-up music almost by definition, you can find excellent pump-up selections from genres such as jazz, R&B, country, and even classical. In fact, some interesting research has found that when subjects listened to rock music and classical music with similar pump-up characteristics, the classical music selections actually were significantly more arousing than the rock music!¹¹

INSIDE A CLASSROOM

Tidy-Up Time

Zoie Moody

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"At tidy-up time, I play the same piece of music each time to signal that it is time to start tidying things away. It is quite fast-paced without being too hectic, which generates a purposeful atmosphere. The children know the music so well that they know when it is nearing the end and position themselves on the carpet ready. We often sing along and dance a little (while staying on task tidying), which helps create a sense of fun and a relaxed, happy place to be.

"Before I used music in my classroom, tidy-up time would take forever, with some children opting out while others did all of the work. It was often a noisy, hectic time, and I would often have to repeat myself lots of times to get the job done. Since introducing music, everyone joins in. There is a calm, happy, purposeful atmosphere, and the class is usually tidy in the three minutes it takes for the music to end. Sometimes we might have a little 'shimmy' with the person next to us, which creates a feel-good vibe and a sense of fun. I rarely have to repeat myself or remind people what they should be doing, and there is a lovely sense of teamwork."

Advice to Teachers: "Do it! It helps to make your classroom a fun place to be. Use the same tracks for specific routines so that the children get used to how much time they have to complete the task."

Suggested Songs: "It doesn't matter what music/song you use, as long as you use the same one each time. I use a funky track so that we can have a little dance along the way should we so choose!"

- ♪ Vocal or instrumental selections work equally well. Most people are probably more familiar with pump-up music with vocals, but there are also many great instrumentals that would serve as well, and it might be good to broaden your students' musical horizons a bit by including instrumental pump-up songs in your mix.
- ♪ Use ramping to build energy over longer stretches of time. When you have ten or fifteen minutes to play several musical selections back-to-back, you can use the ramping technique to take your students from a low-energy state to a high- (or at least higher-) energy state. Say, for example, that your students tend

to drag into class a few at a time on Monday morning. Have a medium-tempo and medium-energy song on as the first students enter. Follow that with a higher-tempo song, and follow that song with one with higher energy still. You will notice that your students' body language demonstrates increasing energy over time. In fact, the rationale behind Muzak programming grew out of studies done by the U.S. Army in the 1960s, demonstrating that when popular selections were sequenced in order of ascending energy, workers became more alert and attentive (Rosenfield, 1985). If you time it right, you will have your students energized for learning just as class is ready to start.

- ♪ Don't mess with popular favorites. A number of studies have shown that most people generally favor up-tempo music to slower-tempo music,¹² so your students will probably by and large enjoy your periodic use of pump-up music. However, research has also shown that people get very attached to their favorite songs,¹³ so if you decide to play a cover version of a student favorite, just realize that you do so at your peril. You will probably get complaints.

Follow the guidelines laid down here, and you will soon have those sleepy students awake and in a great mood for learning. As always, watch how your students react and adjust. Slowly over time you will build a whole list of songs that work well for you.

What to Avoid

In addition to the previously mentioned warning about not playing pump-up music (or any music, for that matter) while doing direct instruction, here are a couple of other caveats to keep in mind.

The Danger of Overstimulation

While pump-up music is wonderfully effective for arousing students when they are in low-energy states, you have to be careful that you don't take things too far and overstimulate them. Moderate levels of arousal are optimal for learning. Too little arousal, and students don't bring enough attention to bear on the task at hand; too much arousal, and they can start acting crazy or silly—again, not a good state for learning.

Teachers sometimes get in trouble in this regard when they anticipate that students will be in a low-energy state, but this turns out not to be the case. The teacher who plays pump-up music when his or her students are already aroused runs the risk of sending them over the edge. The key here (as usual) is kid-watching. If you anticipate a low-energy state at a certain time and plan to use pump-up music for the occasion, you need to observe your students prior to turning the music on to make sure that your assumption was correct. If you find that your students are already energized enough to learn, you should forgo the use of the planned music, perhaps substituting less-arousing background music in place of the pump-up selection.

Chaotic and Unsafe Movement

As previously mentioned, the arousing effects of pump-up music can be further amplified by having students move around the classroom. In general, it's a great combination—students get an extra shot of energy, and the movement activity gets done quicker than it would have otherwise. But again, be sure to observe your students before you give your directions for the activity and turn on the music. If they are already somewhat aroused, the double shot of adrenaline could lead them to move too quickly around the room, possibly leading to unsafe conditions. Some of the danger can be mitigated by teaching students in advance what safe movement looks like in your classroom and establishing safe movement procedures. But even if you have stressed safe movement, you have to be careful. When students get pumped up, those routines sometimes magically disappear from their heads (we're sure you're shocked!). If you have planned to play pump-up music behind a movement activity, but you see that your students are already in a high-energy state, either tone down the music by switching to a less-energizing piece, or tone down the movement you ask them to do.

Getting Started

An obvious starting place is to use tracks from collections designed to be energizing—for example, compilations of dance music, collections marketed specifically as “energizing” music, or the ever-popular Jock Jams collections that are often used to pump up fans at athletic events. The chances are most of the songs found in these collections will exhibit many of the characteristics of pump-up music discussed in this chapter.

In addition, you can use the browse function on your favorite online music source to find music that fits the bill. Now, we know that we already warned you against assuming that *all* songs found in certain genres will automatically work for pump-up music, and that warning still stands, but that doesn't mean that making some initial assumptions isn't a good way to *start* your search. For example, in iTunes, you can start by browsing genres such as dance, electronic, fitness & workout, hip-hop/rap, Latin jazz, and rock. When you click on some of these genres, menus of subgenres open up that allow you to refine your search. Sample selections from a number of artists, and you will find more good choices than you will ever be able to use in class.

For more ideas to get you started, see our Top 40 list below, our expanded list of pump-up selections in Appendix C, and the other suggestions found on our website, www.rockandrollclassroom.com.

Our Top 40 Pump-Up Songs

Following are some of our favorite pump-up songs. As you can see, you can find good pump-up songs from a variety of genres and time periods, both lyrical and instrumental. Our intention with these Top 40 lists is to give you ideas so that you can get off to a quick start. Certainly you will have your own tastes and favorites. Also, we would like to remind you that pump-up music and feel-good music often overlap, so some of the songs found here may serve the dual purpose of energizing your students while simultaneously raising their moods. Have fun with it!

1. "Accidental Mambo," Mambo All-Stars
2. "Any Way You Want It," Journey
3. "Bandstand Boogie," Les Elgart and His Orchestra
4. "Beer Barrel Polka," Lawrence Welk
5. "Best Years of Our Lives," The Baha Men
6. "Boogie Woogie Bugle Boy," Bette Midler
7. "Born to Be Alive (Club Version)," Patrick Hernandez
8. "Brassman's Holiday," Arturo Sandoval
9. "Bumble Boogie," B. Bumble and the Stingers
10. "Cancan," Jacques Offenbach
11. "Cool Affair (Eric Kupper Remix)," Black and Brown

12. "El Tropicana," The Socka Boys
13. "Friday Night Shuffle," Larry Carlton
14. "Fun, Fun, Fun," The Beach Boys
15. "Get Ready for This," 2 Unlimited
16. "Hot, Hot, Hot (Radio Edit)," Buster Poindexter and His Banshees of Blue
17. "House of Tom Bombadil," Nickel Creek
18. "I Got My Mojo Working," The Paul Butterfield Blues Band
19. "I Like to Move It," from *Madagascar*, The Party Cats
20. "In the Mood," Doc Severinsen
21. "It Don't Mean a Thing," Ella Fitzgerald
22. "I've Been Everywhere," Johnny Cash
23. "Jumpin' at the Woodside," Count Basie and His Orchestra
24. "Main Squeeze," Chuck Mangione
25. "Mickey," Toni Basil
26. "Outa Space (Single Version)," Billy Preston
27. "Punchdrunk," Bela Fleck
28. "Rock and Roll Part 2," Gary Glitter
29. "Sabre Dance," from *Gayane*, Aram Khachaturian
30. "Sandstorm," Darude
31. "Seventy-Six Trombones," from *The Music Man*, Ensemble
32. "Shake a Tail Feather," Ray Charles
33. "Southbound," The Allman Brothers Band
34. "Strike It Up," Black Box
35. "The Final Countdown," Europe
36. "Toss the Feathers," The Corrs
37. "Turn the Beat Around," Gloria Estefan
38. "Twilight Zone," 2 Unlimited
39. "William Tell Overture, Finale," Gioacchino Rossini
40. "Yackety Sax," Boots Randolph

Notes

1. Safranek, Koshland, and Raymond (1982) had subjects complete a motor task with no rhythmic background, with an

even beat, and with an uneven beat. With no rhythmic background, subjects demonstrated a consistent personal rhythm. With a steady beat, however, subjects adjusted their movements to match the beat, and their movements became smoother (161–168).

2. Waterhouse, Hudson, and Edwards (2010) had subjects cycle while listening to music of different tempi. They found that speeding up the music increased work output and raised heart rate. In addition, subjects reported liking the faster music significantly more than the slower music selections (662–669). Wininger and Pargman (2003) found that subjects rated satisfaction with the music listened to while working out as the most important factor in exercise enjoyment (57–73).
3. Bernardi, Porta, and Sleight (2006) exposed subjects to six different music selections while measuring physiological factors. Breathing rate, blood pressure, and heart rate all increased with exposure to faster tempi and simpler rhythmic structures, demonstrating a clear arousal effect (445–452). Van der Zwaag, Westerink, and van den Broek (2011) had subjects listen to pop and rock songs while conducting an office task. Increased tempo was found to raise arousal and tension (250–269). Rickard (2004) demonstrated that, when musical characteristics identified as “emotionally powerful” were combined with a faster tempo, they significantly increased arousal (371–388).
4. Stekelenburg and Van Boxtel (2002) had subjects perform a reading task. Novel sounds were introduced into the environment, and subjects exhibited an orienting response to the sounds that included heart rate and respiratory deceleration. When the stimulus sound was presented repeatedly, subjects habituated to it and the orienting response ended (707–722). Gomez and Danuser (2004) showed that heart rate appears to lag behind other physiological responses when arousing music is played, with skin conductance and respiration demonstrating an arousal effect to thirty-second musical excerpts while heart rate remained the same (91–103). Graham and Clifton (1966) hypothesized that heart rate would decelerate when orienting but accelerate when the stimulus elicited a startle reaction or was judged to be dangerous. This hypothesis appears to be confirmed by subsequent research (305–320).

5. Phillips-Silver and Trainor (2005) designed an experiment where infants were bounced on either every second beat or every third beat while listening to a rhythmic pattern with no clear accents. Later, the infants that were bounced on every second beat preferred to listen to a rhythmic pattern with accents every two beats, and those bounced every third beat preferred to listen to a rhythmic pattern with accents every three beats. These results indicate a clear connection between movement and musical preference starting early in life (1430). Phillips-Silver and Trainor (2007) then extended these results by repeating the experiment with adults. They found that adults, too, prefer to move in response to music and that they will interpret an ambiguous rhythm to be the same as one that they have moved to previously. That is, adults who bounced previously in march time (every two beats) preferred to bounce in march time to music with an ambiguous rhythm, while adults who bounced previously in waltz time (every three beats) previously preferred to bounce in waltz time to an ambiguous rhythm (533–546).
6. Edworthy and Waring (2006) had subjects listen to no music, fast/loud music, fast/quiet music, slow/loud music, or slow/quiet music while exercising on a treadmill. Subjects preferred exercising to music rather than no music, and fast/loud music was found to lead to optimal exercising (1597–1610). Karageorghis, Jones, and Low (2006) had subjects listen to different tempi of music while exercising at different intensities. They found that people preferred medium-tempo music to slow-tempo music at all exercise intensities, and that they preferred fast-tempo music when exercising at high intensity (240–244, 246–250).
7. Both Copeland and Franks (1991, 101–103), and Birnbaum, Boone, and Huschle (2009, 50–57) found that subjects exercising at slow speeds worked out most efficiently when listening to similarly-paced music. When moving slowly, listening to up-tempo music caused physiological arousal and led to lowered cardiac efficiency.
8. Simpson and Karageorghis (2006) found that subjects running 400-meter sprints ran much more efficiently when listening to synchronous music (music that matched the pace they wanted to run) than when not listening to music (1095–1102).

9. Husain, Thompson, and Schellenberg (2002) had subjects complete a spatial task while listening to four versions a Mozart sonata, created by editing the file to produce slower and faster versions, and to create versions in both the major and minor modes. Results indicated that subjects did better when the tempo was faster, leading to arousal, and when the music was in the major mode, leading to improved mood (151–171). Schellenberg, Nakata, Hunter, and Tamoto (2007) also found that subjects performed better on an IQ test after listening to up-tempo music as compared with slower-tempo music (5–19).
10. Ahmadiasl, Alaei, and Hanninen (2003) had two groups of rats negotiate a water maze. Rats who exercised an hour a day for ten days during the testing period were compared with rats who did not exercise during the testing period. Rats in the exercise group showed higher levels of epinephrine in their hippocampi and had superior maze-swimming times to the no-exercise group, indicating increased spatial learning (106–109).
11. Dillman-Carpentier and Potter (2007) demonstrated that subjects were more aroused when listening to fast-paced music as opposed to slower-paced music—no surprise there. But when they looked at how genre interacted with measures of arousal, they found that subjects were significantly more aroused when listening to fast-paced classical music compared with fast-paced rock music. They hypothesized that the rock music did not arouse subjects because they were more familiar with the genre, while most of the subjects were not as familiar with faster-paced classical music, and thus they attended to it better, leading to higher levels of arousal (339–363).
12. Holbrook and Anand (1990) found that subjects generally prefer music with a medium tempo, but that the more aroused they are, the more they prefer faster-tempo music (150–162).
13. Geringer and Madsen (1987) investigated pitch and tempo differences on subjects ranging from fifth grade through college age. They found that subjects consistently preferred the original versions of popular tunes to versions altered in any way (204–212).