THE FLORIDA STATE UNIVERITY

COLLEGE OF MUSIC

# THE EFFECT OF BACKGROUND MUSIC ON READING COMPREHENSION AND SELF-REPORT OF COLLEGE STUDENTS

By

AMANDA GILLIS

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The members of the committee approve the thesis of Amanda Gillis defended on July 8, 2010.

_____
Jayne Standley
Professor Directing Thesis

_____
Dianne Gregory
Committee Member

_____
Alice-Ann Darrow
Committee Member

The Graduate School has verified and approved the above-named committee members.

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# ABSTRACT

The study investigated the effects of background music on reading comprehension skills of college students. Seventy-one participants read a health related article in one of three conditions: silence, music with lyrics, and music without lyrics. After reading the article, participants completed a demographic questionnaire. Participants in the music conditions completed an additional music questionnaire. To test reading comprehension, participants were asked to answer five multiple choice and five true/false questions pertaining to the reading. It was hypothesized that participants in the silence condition would perform better than participants in the music condition. Results indicated that there were no significant differences among groups

# CHAPTER 1

## INTRODUCTION

The presence of music is more prevalent now than ever before in history. Not only is music an art form for enjoyment, it also serves psychological (Lin, Hsu, Chang, Hsu, Chou, & Crawford, 2009), behavioural (Hallam & Price), cognitive (Furnham, Trew, & Sneade, 1999), and emotional functions (Cevasco, 2008).

To date, the effects of background music have been of interest to various groups of researchers including psychologists, therapists, and clinicians. Applied psychologists are interested in how music increases or decreases productivity; cognitive psychologists, in how music effects attention and processing information during various tasks; and personality theorists in individual differences in the presence of music while performing a task.

Furnham and Bradley (1997) discovered the particular effects of music are unpredictable due to various forms of individual experiences associated with specific music. Although there is a generalization among listeners in our response to stimulating or relaxing music, individuals experience associations related to particular song or genre with a past event that may potentially elicit memorable feelings of happiness or sadness.

In the western world, music is available via television, radio, video, recordings, and also as background music in public places such as shops and hospitals. With such abundance of music, the need to understand how music affects both our cognition and change in behavior is universal. Researchers examined the link between stereo headset use and employee work responses. Results indicated that those in the stereo headset condition significantly improved their work performance and mood (Oldham, Cummings, Mischel, Schmidtke, & Zhou, 1995). Little is known about the exposure of music with regard to its effect on children. Given the fact that music is widespread within western society, we might expect their exposure to be significant. However, we do know that during adolescent years, music becomes important with teens listening to music approximately 3 hours a day. North and colleagues found that listening to music was preferred to other indoor activities such as doing homework, talking with parents, or reading (North, Hargreaves, & O'Neill, 2000). Studies have also shown that most

studying in the home occurs under music conditions. In a home study survey of 387 students, Patton and colleagues found that most students chose quiet settings to perform reading assignments, whereas math and written work were completed in the presence of radio, stereo, or television. Overall, television was a moderate distracter and students considered radio and stereo as beneficial (Patton, Stinard, & Routh, 1983). Many other surveys have concluded that students combine homework and studying with listening to the radio or watching television. Researchers have discovered that 80 % of high school students do homework while listening to the radio whiled 50 % do homework while watching television. In general, students have perceived a decrease in performance on learning assignments in the presence of background media, but an increase of performance on paper and pencil assignments (Beentjes, Koolstra, & van der Voort, 1996). With research of the aforementioned studies, the question is whether or not background music or media is beneficial or detrimental to the students' performance.

# CHAPTER 2

## REVIEW OF LITERATURE

According to certain limited-capacity theorists, background music and media potentially hinder cognitive performance due to the limited amount of mental resources used for cognitive processing (Basil, 1994; Lang, 2000). Limited capacity theorists have two schools of though: 1) disturbance occurs when awareness capacity is exceeded and 2) structural interference occurs when tasks are performed simultaneously.

In two experiments, Bourke and colleagues examined the limitations on simultaneous tasks and found that tasks should be structured according to a general factor as measured by interference (Bourke, Duncan, and Nimmo-Smith, 1996). The combination of homework and media challenges students with maintaining attention on two tasks. Human mental resources have limited capacity and, therefore, allow only part of the information to be processed. This is particularly true because content of television can elicit a response as a reaction to stimuli such as sound effects, movements, visual complexity, etc (Lang, 2000). For example, Pool, van der Voort, Beentjes, and Koolstra (2000) found that a Dutch-speaking television program inhibited eighth grade students' performance on writing assignments, whereas English-speaking music videos did not cause distraction. Similarly, Pool, Koolstra, and van der Voort (2003) examined how background soap operas affected homework performance and time. Students performed a writing task and memorization task in one of three conditions: soap opera episodes, soundtrack of soap operas or silence. During the memorization task, students were asked to answer questions without reading material present, whereas during the writing assignment the reading material was available. Results showed that students in the soap opera conditions performed worse and used more time compared to the silence condition. Students in the television condition shifted between television and time spent on task. However, other background media did not have any affect on performance. The results of these two studies suggest performance decreased due to shifting between homework and television, which led to a decrease in the processing of homework assignments. Because soap operas offer comprehensible information and music videos are easily understandable, soap operas most likely demand more limited attention capacity. Lang

(1995) indicates that if a message is easily understood, attention capacity is relatively small.

Within our culture, there are several different types of music. Each individual has his/her preference of music whether it's jazz, rhythm and blues, pop, rock, or classical to name a few. Music affects us in different ways and can either cause arousal or lower arousal, depending upon the type of music. Music can have emotional effects on mood as well as varying effects on our ability to concentrate on cognitive tasks. However, research suggests that many students listen to music while studying (Beentjes, Koolstra, & van der Voort, 1996; Patton, Stinard, & Routh, 1983). Etaugh and Michaels (1975) found that college aged students who usually listen to music while studying performed better on a reading comprehension test in the presence of music. They also found that males performed better than females while listening to preferred music. This indicates that unfamiliar sounds are more distracting than familiar sounds. Similarly, Etaugh and Ptasnik (1982) researched the presence or absence of preferred music on reading comprehension of forty college students. After reading the passage, students were either allowed to relax or read unrelated material. They found that individuals who seldom studied in the presence of background music displayed greater degree of comprehension during silence conditions, while those who regularly studied in the presence of background music performed better during music conditions.

Tucker and Bushman (1991) studied the effects of rock and roll music on mathematical, verbal, and reading comprehension tasks. Results showed that performance of mathematical and verbal skills decreased, whereas reading comprehension remained consistent. One element that may affect performance during music conditions is the complexity of the music. The musical complexity theory states that, although music can lead to increased performance, increased complexity within music will lead to a decrease in performance compared to less complex music (Furnham & Bradley, 1997; Furnham & Strbac, 2002). Previous studies on complexity contained music without lyrics (Furnham & Bradley, 1997; Furnham & Allas, 1999). However, lyrics can add a dimension of complexity as another level of processing for the brain. Banbury and Berry (1998) found that background noise in combination with words decreased memory, while background noise without words did not have any notable effects. Salame and Baddeley (1989) also

looked at the effects of music on short-term memory (STM). Participants were asked to recall a number sequence while listening to vocal or instrumental music. Participants in the instrumental music condition were able to recall numbers more accurately than those in the vocal music condition. The words were distracting to those in the vocal music condition, but instrumental music was not distracting. Wolfe (1983) examined the effects of loudness of background music. Participants were assigned to one of three conditions: (1) task only, (2) task plus background music at 60-70 dB, (3) task plus background music at 70-80 dB, and (4) task plus background music at 80-90 dB. Tasks consisted of completing math problems and answering questionnaires. Results showed there to be no significant effect on task performance during music conditions. The majority of participants, in the 80-90 dB music group, perceived loudness as the most distracting factor.

The Yerkes-Dodson law states that arousal levels increase performance to peak levels, whereas over-arousal or stimulation decreases performance. Also performance declines more quickly when a task is complex. Research suggests that stimulating music increases arousal and performance on simple task, while deteriorating performance on a complex task (Hallam, Price, and Katsarou, 2002). The arousal levels of music may show a link to personality factors and environmental stimuli. Researchers have highlighted individual differences as probable influences of response to background music (Furnham et al., 1999). There has been a variety of studies that have examined the differences between performance of extroverts and introverts. Furnham, Gunter, and Peterson (1994) examined the effects of television on cognitive processing. Reading comprehension tasks were completed in two conditions: silence and the presence of television. Results showed a significant difference between personality and condition. Both introverts and extroverts performed better during silence condition and extroverts performed better than introverts in the presence of television.

Different personality types function differently at various arousal levels. Geen (1984) measured the preferred stimulation levels in introverts and extroverts and their effects on arousal and performance. Results indicated that introverts performed most effectively at lower level arousal than extroverts. Cassidy and Macdonald (2007) studied the effects of music classified as high arousal and negative affect (HA), low arousal and

positive affect (LA), and everyday noise during cognitive tasks performed by introverts and extroverts. Results indicated that performance for both introverts and extroverts decreased while listening to background music and noise compared to performance during silence conditions. HA music appeared to have more detrimental effects than LA music. Introverts displayed more negative effects than extroverts during HA music and noise conditions. Furnham and Strbac (2002) extended a previous study and examined whether background noise was as distracting as music. Participants were asked to perform a reading comprehension task, a prose recall task, and a mental arithmetic task in the presence of silence, garage music, or office noise. Results confirmed that extroverts performed better than introverts during music and noise conditions, but the same during silence condition. Daoussis and McKelvie (1986) investigated how rock and roll music effects task performance on introverts and extroverts. Findings indicated that introverts performed poorer on tasks during music conditions than silence condition. With the aforementioned findings, we can expect background music to have a more negative effect on introverts than extroverts. However, we can conclude that extroverts will be more distracted by negative affective background music than positive affective music due to mood type. Belojevic and colleages (2001) examined responses to noise by measuring concentration, fatigue, and annoyance during noise and silence conditions. They found that under music conditions, introverts experienced slower performance rate and more difficulty with concentration.

There has been and continues to be immense interest in the effects of background sound on individuals' performance of differing cognitive tasks. Limited research has focused on the effects of noise on task performance. It has been suggested that short-term memory may be a fundamental building block of reading comprehension. Boyle and Coltheart (1996) examined the effects of irrelevant sounds on phonological coding in reading comprehension and short-term memory. Irrelevant sounds included irrelevant speech, accompanied and unaccompanied singing, instrumental music, and silence conditions. They found that accuracy was unchanged by irrelevant sounds, but was a challenge due to complexity of sentences. However, word recall was affected by irrelevant sounds. Kjellberg, Landstorm, Tesarz, Soderberg, and Akerlund (1996) studied responses to noise and factors that influence those responses. After measuring noise in

the workplace, participants were given questionnaires and factors that affected annoyance. Annoyance was related to sound level, and distraction was related to self-control of the noise and noise predictability. Results noted that background noise resulted in stress and had an adverse effect on cognitive performance. A later study (Evans and Johnson, 2000) suggests that noise is both stressful and harmful to health and decreases levels of enthusiasm. In this study, results indicated that individuals in the noise condition experienced higher levels of urinary epinephrine (marker of stress) and had fewer attempts at unsolved puzzles. In their study of noise distraction on undergraduate students, Banbury and Berry (1998) examined the effects of office noise (with and without speech) on memory for recall and mental arithmetic. They found that during mental mathematics and recall, task performance significantly declined in the presence of background office noise compared to silence conditions. Broadbent (1958) tested the effects of noise on complex mental tasks. Results showed that noise, compared to silence conditions, deteriorated performance over time.

Over the past several decades, there has been great speculation about the benefits of musical training on academic achievement. There has been speculation that average musical abilities in both children and adults co-occur with above average abilities in academic performance. It has been presented that music training potentially enhances other cognitive functions. The Mozart Effect has generated much controversy in the research of active participation, music instruction, and passive music listening. There has been prior research that shows music instruction to be effective in improving spatial skills (Hetland, 2000) but the Mozart Effect has not been validated by recent research. In a pilot study, Schellenberg (2004) examined the premise that music lessons increase general intelligence. Participants were randomly assigned to one of four groups: standard keyboard lessons, Kodaly voice lessons, or no lessons. Participants were administered the Wechsler Intelligence Scale for Children Third Edition (WISC-III). Schellenberg found that combined music groups had significantly larger improvement of seven IQ points than those in the drama and no lessons group. In discussion, Schellenberg concluded that music lessons may potentially improve IQ by exposing participants to supplemental experiences.

Hurwitz, Wolff, Bortnick, and Kokas (1975) compared two groups of primary grade children on tasks of temporal and spatial abilities. One group received exposure to the Kodaly Music Training Program, while the other group received no music. They found that the music group performed better on both temporal and spatial tasks than the control group. Also children in the music group performed more effectively on the reading tests. Contrastly, Costa- Gimoi (2004) found that three years of weekly piano lessons did not affect arithmetic performance. With regard to research of older children and academic achievement, Barnet (1987) found that SAT scores were predictors of music grade point average in non-performance courses of freshman music students. Ho, Cheung, and Chan (2003) found a like between music lessons and verbal memory performance. Results of the study showed that children with music training illustrated better verbal memory performance than the control group. There was no significant difference in the visual memory performance of groups. This study is consistent with a previous study for adults (Chan, Ho, and Cheung, 1998). Results of both studies suggest that music lessons may have implications for reading ability and memory processing. To date, however, research does not fully support the fact that music lessons offer an advantage over other extracurricular education with respect to academic performance.

Many researchers have been interested in how background music in the classroom can possibly enhance learning. Typically, studies have suggested that soothing and calming music may cause arousal for learning. In this area of study, mixed results have been shown. Hall (1952) explored the effects of music on reading comprehension of 245 $8^{th}$ and $9^{th}$ grade students. Results indicated, in the presence of background music, 58 % of students showed an increase in scores in the Nelson Silent Reading Tests. Also, this study suggests that background music increased accuracy and those considered 'below average' benefitted more from the background music than those considered 'above average'. In a smaller study, Scott (1970) compared performance of arithmetic tasks in four different conditions: the normal classroom environment; the introduction of background music into the normal classroom; children sitting in three-sided booths; and background music. Results revealed that background music in the classroom had a calming effect on four hyperactive students. Students were observed as being most attentive when background music was introduced into the normal classroom setting.

Madsen and Forsythe (1973) investigated the effects of contingent music listening on mathematical skills of 6th grade students. After working on math problems for 20 minutes students were assigned to one of four conditions: (1) contact control group- students worked on other subjects, (2) math games control group- students played math games, (3) dance-listening group- students listened to music that was played through a stereophonic high-fidelity system and had the option of dancing and listening to music, and (4) earphone listening group- students listened to music through individual earphones inhibiting socialization. Results showed that there was no significant difference between the two control groups, but there was a significant difference between the control and contingent music listening groups. Contingent music listening increased the number of correct responses to math problems.

Mitchell (1949) compared performance on a comprehension task in the presence of a variety show, a musical show, or silence. Mitchell found that reading comprehension was not adversely affected by the musical selections. Research has also indicated that background music does not enhance test performance. Henderson, Crew, and Barlow (1945) examined students on various sections of the Nelson-Denny Reading Test. Pop music showed significant distraction, whereas classical music showed no indication of distraction in the vocabulary or paragraph sections of the test. Mowsesian and Heyer (1973) studied the effects of rock, folk, symphonic music, and opera on test performance of students. The music did not have any significant effect on students' performance.

Hallam, Price, and Katsarou (2002) compared arithmetic performance and memory tasks of children aged 10-12 in the presence of music perceived to be calming and relaxing and silence conditions. Results showed children performed better on both tasks during the music condition compared to the silence condition. During the music condition, children completed more arithmetic problems although accuracy was not improved. Furthermore, this study also demonstrated that music perceived as aggressive and arousing impaired performance on the memory task. Hallam et al (2002) also anticipated that calming music can be useful during times when children are over-aroused, such as returning to the classroom from lunch. Conversely, music can be used to stimulate those with a decreased arousal level. Chalmers, Olson, and Zurkowski (1999) have provided support for the above observations. They examined how music effects

noise level in the lunchroom. In the presence of classical music, noise decreased approximately six decibels. Hallam and Price (1998) studied the effects of background music on behavior and performance during a mathematics task. All ten children significantly improved their behavior and performance during the task. Also observed was a decrease in aggression following the study. Giles (1991) suggests that background music can be used throughout the day for several reasons, including, but not limited to: engaging children who are tired or bored, helping students stay relaxed, and providing a calming atmosphere during lunchtime.

According to research, music with special education populations has shown positive results. Savan (1999) examined the effects of Mozart orchestral compositions on ten 12-year-old boys identified as special needs and having emotional and behavioral problems. In the presence of music, it was observed that students became calm and their co-ordination improved. This study suggests that certain sound combinations may stimulate different parts of the brain, which can cause a calming effect.

For many college students, listening to music is an associative task. According to Darrow, Johnson, Agnew, and Rink (2006) an associative task is defined as "listening to music while engaged in other activities." The majority of college students engage in activities such as using the computer, completing homework, or studying for test while listening to music. To date, there have been mixed results on how background music effects cognitive performance. Ransdell and Gilroy (2001) investigated if background music effects the ability to word process fluently and effectively. Forty-five psychology undergraduates wrote an essay in the presence of background music. Results showed that students with some musical background training wrote higher quality essays and longer, more complex sentence structures. Pearsall (1989) investigated listening comprehension in the presence of tonal and atonal background music. Ninety 1st year college students were administered the Sequential Tests of Educational Progress Listening Comprehension Test, Level J under three conditions: (1) no background music, (2) tonal background music, and (3) atonal background music. Pearsall (1989) found that students performed better during the no music condition. It was observed that tonal music seemed to distract because of tonality. Similarly, Hillard and Tolin (1979) also tested

undergraduates using the Sequential Tests of Educational Progress found that scores were higher during the familiar music condition than the unfamiliar music condition.

The aim of the present study was to examine reading comprehension skills of college students in the presence or absence of background music.

# CHAPTER 3

# METHOD

*Participants*

The study was conducted with a sample of 71 students enrolled in a large southeastern university. The individuals were comprised of both undergraduate and graduate students, with varying backgrounds of study. Ages ranged from 18 to 43, averaging 23.6 years. The total sample was composed of 49 females and 22 males. Participants were acquired on a voluntary basis and were randomly assigned to one of three groups: Group 1-task only (no music); Group 2- task plus lyrical background music ("Tik Tok" by Ke$ha); and Group 3-task plus instrumental background music (excerpt from "The Four Seasons-Spring" by Vivaldi). Participants were tested ranging from one to ten per group.

**Table 1: Participants' Demographics**

| | Male | Female | Mean Age | Graduate | Undergraduate |
|---|---|---|---|---|---|
| Silence | 8 | 16 | 24.6 | 9 | 15 |
| Lyrical | 5 | 19 | 28.4 | 13 | 11 |
| Instrumental | 9 | 14 | 23.3 | 9 | 14 |
| Total | 22 | 49 | 23.6 | 31 | 40 |

*Materials*

A Sony Boombox for IPOD was used to play the lyrical ("Tik Tok") and instrumental (excerpt from "The Four Seasons-Spring") selections.

The stopwatch feature on an IPOD touch was used to time duration of the silence group reading and studying the article.

Reading material (See Appendix C) was obtained by searching health articles on www.usnews.com. The excerpt for the study was chosen because of its subject, scarification, which was considered unfamiliar to people. The excerpt was a total of 386 words.

*Music Selections*

The experimental conditions consisted of two musical selections: (1) "Tik Tok" by Ke$ha (3 minutes, 23 seconds) and (2) "The Four Seasons-Spring" by Vivaldi (excerpt lasting 3 minutes, 23 seconds). Songs were chosen because of popularity as rated within the top 5 of "Top 100" for popular and classical music (www.billboard.com; www.ez-tracks.com/top-40-classical-song.html).

*Questionnaires*

Participants in the task only group were given a demographic questionnaire (See Appendix A) and reading comprehension test (See Appendix D), and participants in the task plus music groups were given two questionnaires to complete: demographic and reading comprehension test and music questionnaire (See Appendix B). The Demographic questionnaire requested information from participants regarding age, sex, year in college, musical training, if they usually listened to music while studying, and, if so, what kind of music.

Questions for the music questionnaire were taken from a previous study; Wolfe, 1983. The questions are stated below:

"Did you recognize any of the selections played during the reading? If so, list the titles of the selections you recognized. (2) Did the musical selection seem to interfere with your reading? If so, what aspects of the music seemed to interfere the most? (subjects were asked to check one or more of the following musical elements—melody, rhythm, loudness, dynamics, instrumentation, personal associations to music, or specify another). (3) How much did you like the music selection that was played? (subjects marked a like-dislike rating scale with score of 1 (dislike very much) to 7 (like very much). (4) How often do you listen to music while studying? (subjects marked a scale from 1 (never) to 7, (regularly). (5) How often do you listen to this type of music? (students marked scales of 1 (never), 2 (yearly), 3 (monthly), 4 (weekly), 5 (twice a week), 6 (daily)." Once the experiment ended, participants were thanked for their participation.

*Procedure*

Upon entering the testing room, participants completed a standard consent form (See Appendix F) and received a brief description of the experiment. Participants were randomly assigned to one of three conditions. Participants in the task plus music conditions were informed they would have the duration of the song to read and study the article. Participants in the task only condition were informed they would have a specified amount of time (equal to the duration of the music groups) to read and study the article. At the end of the allotted time, reading excerpts were removed, and all participants were given a short demographic questionnaire. Next participants were given a reading comprehension test consisting of five multiple choice and five true/false questions pertaining to the reading material. A point value of one was assigned to each question on the test and percentages were calculated. After the tests, participants in the task plus music conditions completed a music questionnaire related to the background music presented during testing.

# CHAPTER 4

# RESULTS

*Task Performance*

A one-way analysis of variance was completed to establish whether there was an effect for background music across reading comprehension task performance in the results (Table 2). Results indicated no significant difference in the number of questions correctly answered among the three groups.

**Table 2: Analysis of Variance: Number of Reading Comprehension Problems Completed Correctly by Group**

| Source | d*f* | *SS* | *MS* | *F* | *P* |
|---|---|---|---|---|---|
| Between Groups | 2 | 0.1312 | 0.0656 | 0.07 | 0.932461 |

The mean number of reading questions answered correctly by each group is shown in Figure 1.

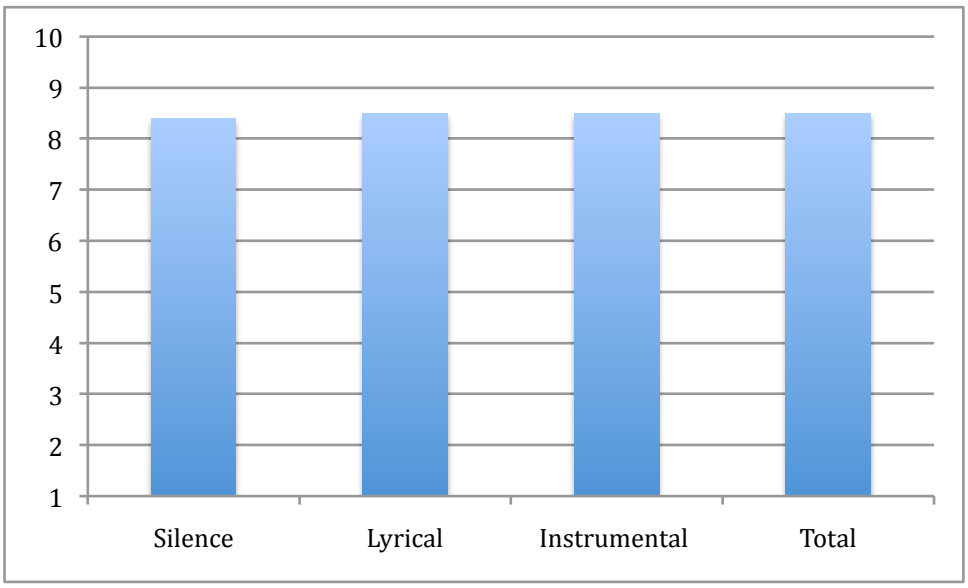

**Figure 1: Mean Number of Reading Comprehension Questions Completed Correctly by Group**

*Questionnaire Analysis*

Responses in Groups 2 and 3 (n=47) to questions regarding music selections during reading were also researched. Table 2 reports responses to the questions "Did you recognize the selection played during the reading?" More participants recognized the instrumental selection than lyrical selection.

**Table 3: Music Recognition**

| Group | Yes | Maybe | No |
|---|---|---|---|
| Lyrical | 15 (62.5%) | 1 (4.2%) | 8 (33.3%) |
| Instrumental | 22 (96%) | 0 | 1 (4%) |
| Total | 37 (78.7%) | 1 (2.2%) | 9 (19.1%) |

For those who stated they did recognize the music selections, Table 4 shows their ability to name the selection. More participants accurately named the instrumental selection.

**Table 4: Ability to List Title**

| Group | Correct | Incorrect | Not Sure |
|---|---|---|---|
| Lyrical | 5 (31.3%) | 1 (6.2%) | 10 (62.5%) |
| Instrumental | 9 (41%) | 3 (13.6%) | 10 (45.4%) |
| Total | 14 (37%) | 4 (10.5%) | 20 (52.6%) |

Responses to the question, "Did the musical selection seem to interfere with your reading?" are in Table 5. Most participants reported that the music selections interfered with their reading.

**Table 5: Music Interference with Reading**

| Group | Yes | Slightly | No |
|---|---|---|---|
| Lyrical | 20 (83.3%) | 4 (16.7%) | 0 |
| Instrumental | 17 (74%) | 6 (26%) | 0 |
| Total | 37 (78.7%) | 10(21.3%) | 0 |

For those participants who stated that music interfered with reading, they were asked to rate which elements of the music interfered most (Figure 2). Melody interfered the most with the instrumental group, while rhythm, loudness, and other (tempo change, lyrics, vocal intonation, & transitions) interfered the most with the lyrical group.

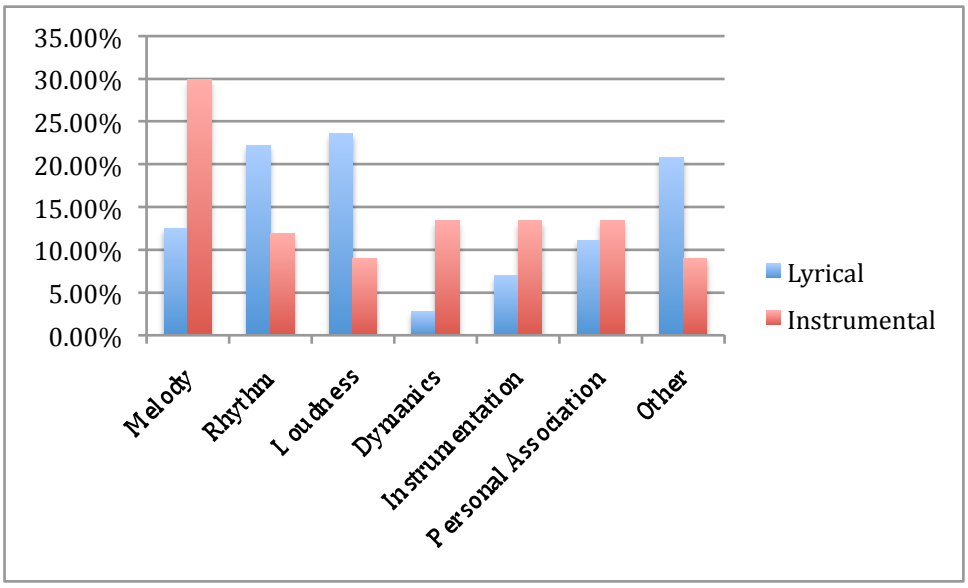


**Figure 2: Elements of Music Interference**

Other results of the present study are as follows: (1) The majority of participants in the instrumental group seemed to enjoy the background music selection played during the task, although many reported they do not usually listen to music while studying. Most participants reported listening to this type of music monthly. (2) The majority of the

participants in the lyrical group marked 4 on the rating scale for the question, “How much did you like the music selection that was played?” Most participants reported they do not usually listen to music while studying. However, many participants reported listening to this type of music weekly.

# CHAPTER 5

# DISCUSSION

The data from this study did not support the hypothesis that music would have a detrimental effect on reading comprehension performance. The results of this study showed no significant differences among groups. Although the hypothesis was not supported, the results of the study are supported by previous research (Wolfe, 1983; Tucker & Bushman, 1991; & Vaughn, 2000).

Despite the fact that results were not supportive of the hypothesis, participants commented that the music was distracting. However, the music did not affect reading comprehension scores when compared to the silence condition. It was observed that participants were alert to background music as evidenced by song recognition, foot tapping, head nodding, and statements included in the questionnaires. The majority of participants noted they had heard the lyrical song previously, but only some correctly stated the title of that music selection.

There are some limitations to this study. A considerable amount of time (3 minutes, 23 seconds) was given to read the article. It was observed that between 2 minutes and 2 minutes 30 seconds, participants appeared restless as evidenced by eyes wandering, whispering amongst themselves, fidgeting with items such as purses or backpacks, and a few stated, “Ok, I’m done.” At times, participants who were late knocked on the door while testing was still in progress. This disruption may have had an adverse effect on concentration.

Further research could extend the musical selection during both the reading and testing conditions. Fill in the blank answers could also be inserted into the reading comprehension test. Future research could shorten the study and test the progression of boredom felt by participants. Further research in the area of background music and reading comprehension is important.

APPENDIX A

DEMOGRAPHIC QUESTIONNAIRE

**Name**_____**Date**_____

1. **Age**_____
2. **Gender** _____
3. **Year in School** _____
4. **Have you had any musical training?**_____
5. **If answered yes to above question, how many years and which instruments?**

   _____
6. **Do you usually listen to music while studying?** _____
7. **If answered yes to above question, what kind of music?**

   _____

APPENDIX B

MUSIC QUESTIONNAIRE

**NAME**_____ **DATE**_____

**1. Did you recognize the selection played during the reading test? _____**

**2. If you answered yes to question number one, list the title of the selection.**

_____

**3. Did the musical selection seem to interfere with your reading? _____**

**4. If answered yes to question number three, circle one or more of the following musical elements:**

- o **Melody**
- o **Rhythm**
- o **Loudness**
- o **Dynamics**
- o **Instrumentation**
- o **Personal association to music**
- o **Other (please specify)**

  _____

**5. How much did you like the music selection that was played? (please mark X above the number)**

Dislike very much Like very much

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

**6. How often do you listen to music while studying? ( please mark X above the number)**

Never Regularly

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|

**7. How often do you listen to this type of music? ( please mark X above the number)**

Never Yearly Monthly Weekly Twice a week Daily

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|

APPENDIX C

HEALTH ARTICLE

## Immune Response Better With Skin Scratch Vaccination

SUNDAY, Jan. 17 (HealthDay News) -- Giving a vaccine through a scratch on the skin (scarification) triggers a stronger immune response than injected vaccines, say U.S. researchers, who also found that scarification requires 100 times less vaccine to prompt an immune response.

Scarification was first used nearly two centuries ago to give the first smallpox vaccinations. Nearly all modern vaccines are given via injection, according to background information in a news release about the study, which is published in the Jan. 17 issue of Nature Medicine.

In a series of tests, the Brigham and Women's Hospital researchers also found that the memory of T-cells -- the cells that mount an immune response against invading viruses -- may be more important than the antibodies generated by injected vaccines. T-cells are located in lymph nodes and blood, as well as in peripheral tissues such as skin and lung.

"This research illustrates the remarkable capacity of the most superficial layer of skin to generate powerful protective immune responses after vaccination," study senior researcher Dr. Thomas Kupper, chairman of the dermatology department at the hospital, said in a news release from the hospital.

"The ability of vaccination through injured epidermis -- or scarification -- to generate such powerful tissue-resident protective T-cells is a completely novel observation that should make us reconsider the way we think about vaccine delivery for all infectious diseases, as well as cancer. After all, our immune system evolved over millions of years to respond to infections of injured skin, not vaccines delivered by hypodermic syringe

into muscle," he noted.

In their experiments, Kupper and colleagues found that scarification with the vaccinia virus offered much greater protection against smallpox than injecting the vaccine. They also found that a melanoma vaccine delivered by scarification was much more effective than injected vaccines in protecting animals against melanoma tumor growth.

"The lessons we are learning from these studies of vaccination by scarification could help us develop new and more powerful vaccines for influenza, HIV, malaria and other infectious diseases," Kupper explained. "We should also continue to explore the implications for developing powerful cancer vaccines, like the one demonstrated by melanoma vaccine results in this study."

*(2010, January 17). Immune response better with skin scratch vaccination. *U.S. Newsand World Report*. Retrieved from http://www.usnews.com .

APPENDIX D

READING COMPREHENSION TEST

**Name_____Date_____**

**Questions below are based on the reading material. Please circle the your answer**

1. **Giving a vaccine through a scratch on the skin called_____**
   - **a.** Intradermal
   - **b.** Prophylactic
   - **c.** Scarification
   - **d.** Epicutaneous

2. **This scratch on the skin triggers a/the_____ response than injected vaccines.**
   - **a.** Stronger
   - **b.** Weaker
   - **c.** Different
   - **d.** Same

3. **This technique, referred to in question # 1, was used nearly two centuries ago to give vaccination for what disease?**
   - **a.** Measles
   - **b.** Skriljevo (form of syphilis)
   - **c.** Mumps
   - **d.** Smallpox

4. **Researchers found that T-cells may be more important than_____ generated by injected vaccines.**
   - **a.** Antipyretics
   - **b.** Antibodies
   - **c.** Antigens
   - **d.** Isomorphs

5. **T- cells located in all of the following *except*:**
   - **a.** Blood
   - **b.** Skin
   - **c.** Lymph nodes
   - **d.** Kidneys

**6. T-cells are cells that mount an immune response invading viruses.**

**a.** True
**b.** False

**7. Researchers found that injecting the vaccinia virus offered greater protection than the new technique against small pox.**

**a.** True
**b.** False

**8. A melanoma vaccine delivered by this new technique was more effective than injecting vaccines in protecting animals against melanoma tumor growth.**

**a.** True
**b.** False

**9. This new technique could help develop new powerful vaccines for influenza, malaria, HIV and emphysema.**

**a.** True
**b.** False

**10. In a recent study, giving a vaccine through a scratch on the skin shows promising results and researchers would like to explore implications for developing powerful cancer vaccines.**

**a.** True
**b.** False

APPENDIX E

HUMAN SUBJECTS COMMITTEE APPROVAL LETTER

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8673 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 3/12/2010

To: Amanda Gillis

Address: 1836 Falconcrest Drive, Tallahassee, FL 32303
Dept.: MUSIC SCHOOL

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
The Effects of Background Music on Reading Comprehension and Self-Report of College-Aged Students

The application that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and two members of the Human Subjects Committee. Your project is determined to be Expedited per 45 CFR § 46.110(7) and has been approved by an expedited review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.

If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 3/10/2011 you must request a renewal of approval for continuation of the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chair of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is IRB00000446.

Cc: Jayne Standley, Advisor
HSC No. 2010.4001

APPENDIX F

CONSENT FORM

# The Effects of Background Music on Reading Comprehension and Self-Report of College Students

You are invited to be in a research study to examine the effects of background music reading comprehension skills of college-aged students. You were selected as a possible participant because you are:

- Between the ages of 18 and 45
- A student enrolled at The Florida State University

We ask that you read this form and ask any questions you may have before agreeing to be in the study. Researchers contact information is located at the end of this form.

This study is being conducted by Amanda Gillis, from The Florida State University College of Music

**Background Information:**

The purpose of this study is to test the effects of background music on reading comprehension skills of college- aged students.

**Procedures:**

If you agree to be in this study, we would ask you to do the following things:

- Read a short health related article
- Complete a questionnaire (demographic and music)
- Complete a 10 multiple choice/true-false test based on the reading

**Risks and benefits of being in the Study:**

There are no foreseeable risk or benefits of being in this study.

**Compensation:**

There is no compensation for participating in this study.

**Confidentiality:**

The records of this study will be kept private and confidential to the extent permitted by law. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records.

**Voluntary Nature of the Study:**

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University. If you decide to participate, you are free to not answer any questions or withdraw at any time without affecting those relationships.

**Contacts and Questions:**

The researcher conducting this study is Amanda Gillis. You may ask any question you have now. If you have any question later, you are encouraged to contact her at 205-240-9868 or amanda-joelle@hotmail.com. You may also contact her academic supervisor, Jayne Standley, at 850-644-4565 or jstandley@fsu.edu

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, you are encouraged to contact the FSU IRB at 2010 Levy Street, Research Building B, Suite 276, Tallahassee, FL 32306-2742, or 850-644-8633, or by email at humansubjects@magnet.fsu.edu.

You will be given a copy of this information to keep for your records.

**Statement of Consent:**

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

_____ _____

Signature Date

_____ _____

Signature of Investigator Date

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BIOGRAPHICAL SKETCH

Amanda J. Gillis

**Education**

- Florida State University, Tallahassee, FL — August, 2010
  Master of Music in Music Therapy

- Samford University, Birmingham, AL — August, 2007
  Bachelor of Arts in Music

**Certifications and Training**

- Board Certification in Music Therapy — March, 2010
- Music Together Teacher Training Workshop — March, 2010
- Orff-Schulwerk Teacher Education Course, Level I — July, 2008
- NICU-MT Certification — July, 2008

**Volunteer, Internship, and Practicum Experiences**

- Tallahassee Memorial Healthcare, Music Therapy Intern — 2009
- Tallahassee Memorial Healthcare, Main Hospital, Music Therapy Practicum Student — 2009
- Tallahassee Memorial Healthcare, Surgery Buddy, Music Therapy Practicum Student — 2008
- Creative Child Learning Center, Music Therapy Practicum Student — 2008
- Tallahassee Memorial Healthcare, Neonatal Intensive Care Unit, Music Therapy Practicum Student — 2007
- The Kids Center, Volunteer — 2006-2007
- Exceptional Foundation, Volunteer — 2003-2004
- Lakeshore Foundation, Volunteer — 2002-2003

**Professional Development**

- American Music Therapy Association — 2008-Present
- Alpha Mu Alpha, Music Therapy Student Organization — 2007-2009
- Delta Omicron International Music Fraternity — 2006-Present

**Honors**

- Golden Key International Honor Society — 2008-2010
- Dean's List, Samford University — 2007