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Hayoung A. Lim

Oral Roberts University, hlim@oru.edu

Eun-Jun Bang

Northeastern State University, bang@nsuok.edu

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THE EFFECTS OF MUSIC LISTENING

ON AFFECT, SELF-EFFICACY,
MENTAL EXERTION, AND
TASK PERFORMANCE OF ONLINE LEARNERS

Hayoung A. Lim, Oral Roberts University
Eun-Jun Bang, Northeastern State University

Key Words *online learning, music listening, positive and negative affect, mental exertion, task performance*

Abstract

Online education is becoming more common in higher education, and the number of students taking online courses is projected to increase dramatically. Despite the popularity of online education, there is scarce research on the psychological well-being for those online learners as they work toward their academic goals. To address this gap, the current study examined the effects of music listening on online learners' mood, perceived self-efficacy, mental exertion, and task performance ($N = 42$). This study specifically focused on an online college education setting and examined the role of music listening and affect within this emotionally-dynamic context. Data analysis utilizing repeated measures ANOVA indicated that daily music listening has a significant influence on positive affect, negative affect, mental exertion, and task performance of the study participants, but not on

self-efficacy. The implications of these findings and limitations of the study are discussed in the paper.

Introduction

Approximately 5.8 million students were enrolled in at least one online learning course in the fall of 2014, and the number of students taking online courses has been steadily increasing in recent years (Allen & Seaman, 2013). While the absolute number of additional students taking online courses continues to increase at high rates, the research on the well-being for those online learners has not been adequately studied. Online learning presents an opportunity to expand access to higher education for traditionally under-represented students (Allen & Seaman, 2013). Online learners might experience unusual psychological challenges and/or learning disabilities that are different from those traditional on-campus learners. Lack of persistence in online education and its consequence of attrition might be the evidence of the hardship and challenges that the online learners are facing day by day. Programs and strategies for improving well-being in online learners need to be explored and developed.

Motivation and Self-Efficacy for Online Learners

One of the most widely used methods of providing a framework for the entire panorama of educational objectives is the Taxonomy of Educational Objectives, also called “TEOs” (Payne, 2003). Concerned with the holistic nature of learning, TEOs are divided into three domains: cognitive, affective, and psychomotor. Most objectives for conventional courses, including distance learning courses, are in the cognitive and affective domains. Student satisfaction and well-being might be related to affective domains of TEOs (Payne, 2003).

Definite and somewhat pervasive evolutionary changes like online learning are taking place in education. This change involves nurturing and naturalizing affective learning outcomes since affective learning takes place literally in every learning environment (Payne, 2003). Affective and cognitive (i.e., academic) phenomena in one’s learning

are not separate. They develop together and influence one another, and both types of the educational outcomes are evidence of concern for the “whole person.” In general, affective domain relates to characteristics such as attitudes, values, interests, opinions, appreciation, and motivations (Lim, 2011; Payne, 2003). According to the TEOs, affective domains in online learning might include awareness, willingness to receive, controlled or selected attention, responding, willingness to respond, satisfaction in response, valuing, preference for a value, commitment, characterization by value of value complex, and characterization. Assisting online programs to establish those affective objectives for the online learners and constructing the online learning environment to accommodate their affective needs might eliminate the potential barriers deterring some students from successfully completing an online program. Therefore, determining which factors or motivators contribute to a successful online learning experience, including student satisfaction and well-being, becomes a critical task for administrators, teachers, and instructional designers in online education.

One key affective, non-academic factor associated with online student satisfaction and persistence or retention in online programs is motivation, specifically, a self-determined type of motivation and self-efficacy (Dabbagh, 2007; Zimmerman, 2000). Dabbagh (2007) defines the emerging characteristics of the globalized online learner population as place-bound, goal-oriented, and intrinsically motivated for learning. Motivation is essential for the improvement of student achievement, but Sarsar (2012) reports the number one problem in online learning is a low personal motivation level. Researchers agree that intrinsically motivated learners who possess a high internal locus of control, which values self-effort—coupled with a positive attitude toward the online program and instructor as well as a high expectation for grades and degree completion—are more likely to succeed in an online course (Dabbagh, 2007). Lack of motivation has been indicated as one of the student barriers in online learning (Hart, 2012). Sharma (2005) states that motivation is the aroused state of the individual that under appropriate circumstances initiates or regulates behavior in relation to goals. That is to say, one’s level of motivation could be strongly influenced by the level of arousal and affect. The level of positive affect and negative

affect might determine one's motivation level at the time of learning (Husain et al, 2002; Sarsar, 2012). It is very clear that online students' behavior is one of the important indicators of motivation. However, in order to increase their motivation, it is necessary to take into account not only the students' behaviors, but also their feelings (Sarsar, 2012).

An online student's self-concept of academic performance has also shown to be a significant predictor for success in a distance education setting (Dabbagh, 2007). Self-concept is a collection of self-descriptive constructs that incorporates many forms of self-beliefs, self-knowledge, self-identity, and self-evaluating feelings (Marsh & Shavelson, 1985; Zimmerman, 2000). Self-concept has been defined as a global perception of oneself and one's self-esteem and affective reactions to that self-perception (Zimmerman, 2000). The academic self-concept can be understood as self-efficacy, which focuses exclusively on the cognitive construct of self-beliefs, self-knowledge, and task-specific performance expectations. Self-efficacy influences students' academic motivation in terms of activities, levels of effort, persistence, and emotional reactions. Higher levels of self-efficacy might increase students' resiliency and retention in the program (Hart, 2012). Students' beliefs about their efficacy to manage academic task demands can also influence them emotionally by decreasing their stress, anxiety, and depression (Bandura, 1997). Collectively, students' beliefs about their academic capabilities (i.e., self-efficacy) play an essential role in their motivation to achieve goals in online learning.

Positive Affect in Online Learners for Their Motivation and Task Performance

It is suggested that motivation indicated by self-efficacy, mental effort, and self-concept of academic performance are the key affective (non-academic) factors associated with online students' well-being and satisfaction. Researchers have also agreed that a student's motivation and perceived self-efficacy might be influenced by his or her affect and mood (Bandura, 1997; Sarsar, 2012; Zimmerman, 2000). Productive learning outcomes or "quality-of-work" in online learning may be influenced by the learner's mood at the time of learning. Heightened

arousal with positive feelings can influence the way cognitive material is processed, thus influencing performance in high-cognitive demands, retention, and creativity (Ashby et al., 1999; Estrada et al., 1997; Isen, 1999; Lesiuk, 2005; 2010; Lim, 2008; Necka, 2000; Revelle & Loftus, 1992; Schellenberg, 2001). Pleasant mood responses (e.g., positive affect) are reported to enhance the creative problem-solving ability and improve performance on creative problem-solving tasks (Lesiuk, 2010). On the contrary, negative affect can influence cognitive strategies in diminished ways. For example, Lesiuk (2005) reports that while taking online courses and submitting the requirements/assignments using information technology (IT) devices, participants' stress responses were in the form of high anxiety, increased mental exertion and irritability.

Effect of Music on Positive Affect and Task Performance

The quality of work and/or task performance in online learning might be adversely affected by stress and certain negative moods (Lesiuk, 2005). Affect is most influential when tasks are complex and require highly generative processing such as online learning. There is some evidence that music is one of the significant factors contributing to one's positive moods (i.e., affect) and task-performance. For example, immediately following music listening, negative affect was decreased significantly, and positive affect was increased significantly (Lesiuk, Pons, & Polak, 2009; Lesiuk, Polak, Stutz, & Hammer, 2011). The link between music listening and improved task performance (productivity and creativity of work) was confirmed in the moderately high-stress occupation of computer information systems development (Lesiuk, 2005).

Lesiuk (2010) examined the effect of preferred music listening on state-mood and task performance in a high-cognitive demand occupation. According to Lesiuk (2010), "high-cognitive demand" is a relative term given to challenges presented to individuals that may occur on a cognitive continuum from a need for focus and selective attention to systematic analysis and creative problem-solving. In Lesiuk's (2012) study, 24 professional computer information systems developers in an

IT company participated in a three-week study with a music/no-music/music weekly design. During the music week, participants listened to their preferred music “when they wanted, as they wanted.” Self-reports on positive/negative affect and task (cognitive) performance were measured throughout the three weeks. Preferred music listening improved state-mood levels resulting in higher positive affect and lower negative affect scores, and higher self-assessment scores of task performance during the music weeks (Lesiuk, 2010). Positive affect and the self-assessment scores of quality of work were lowest with no music, while time-on-task was longest when music was removed for the computer information system developers (Lesiuk, 2005; 2010).

Increases in positive mood helped explain the improved work performance of information systems developers when working with preferred music (Lesiuk, 2005; 2010). Although improved task performance was attributed to enhanced mood (i.e., positive affect) via the preferred music listening, there was no account of the individual differences in the use of music listening for work. When music evokes a pleasant mood and an increased arousal state, participants perform better on non-musical tasks (Lesiuk, 2010). The use of music listening was shown to improve mood states over time and quality of work in the cognitive and technological tasks (Lesiuk, 2005).

The optimally increased arousal and positive affect induced from music might enhance task performance (Ashby, Isen, & Turken, 1999; Lesiuk, 2005; 2010; Lim, 2008; Necka, 2000; Revelle & Loftus, 1992; Schellenberg, 2001; Thompson et al., 2001). The previous studies provide the evidence of the benefit of music listening for positive mood change and enhanced perception of task performance (i.e., self-efficacy) in the computer users for the high-cognitive demand tasks (Lesiuk, 2005; 2010; Lesiuk, Pons, & Polak, 2009). An individual’s degree of negative mood is statistically significantly lower when he or she is listening to the preferred music, which indicates that music listening is an anxiolytic treatment in times of stress and demand of high mental exertion (Lesiuk, 2010).

The Present Study

The purpose of the present study is to investigate the effect of music listening on the mood, perceived self-efficacy, mental exertion, and task performance of online learners. This study focuses on a specific higher education learning environment, which is an online college education setting, and examines the role of music and affect within this emotionally dynamic context. While several perspectives of music and affect are relevant in the music online-learner relationship, increased short-term positive affect and decreased negative affect through preferred music listening was emphasized in this study. In addition, the effect of music on a key factor associated with online students' well-being, satisfaction, and persistence or retention, motivation, was explored by measuring self-efficacy, mental effort (i.e., mental exertion), and a self-assessment form of task performance. The following research questions were addressed:

1. Does the treatment condition (music vs. no-music) affect mood (positive and negative affect)?
2. Does the treatment condition (music vs. no-music) affect perceived self-efficacy?
3. Does the treatment condition (music vs. no-music) affect perceived mental exertion?
4. Does the treatment condition (music vs. no-music) affect perceived task performance?

Method

Participants

Table 1 presents descriptive information on study participants ($N = 42$). Forty-two online students (male = 9, female = 33) who were enrolled in at least one online course offered for one semester from a university located in the southwestern United States participated in the study. Participants were selected over two semesters. While participation was strictly voluntary, an incentive of extra credit was given by each online course instructor for their participation. Participants completed

a four-week music listening study in which participant demographics, positive and negative affect, self-efficacy, mental exertion, and task performance were measured in a series of surveys. After final approval by a university institutional review board (IRB), the survey form was embedded in the online courses with a consent form. The participants were 19 to 60 years of age ($M = 34.62$, $SD = 13.92$). A wide range of daily music listening time from 10 minutes to 16 hours a day was reported ($M = 3.8$ hours, $SD = 4.7$ hours).

Characteristics	Number (%)
Gender	
Male	9 (21.4%)
Female	33 (78.6%)
Age group	
19 to 29 years old	20 (47.6%)
30 to 39 years old	6 (14.3%)
40 to 49 years old	8 (19.0%)
50 to 59 years old	6 (14.3%)
60 years old and above	2 (4.8%)
Hours of daily music listening	
10 minutes to 1 hour	12 (28.6%)
2 hours to 3 hours	18 (42.9%)
4 hours to 5 hours	16 (16.7%)
16 hours	5 (11.9%)

Table1. *Demographic Information for Participants in Study (N = 42)*

Research Design

The study is a quasi-experimental field study utilizing an interrupted time series with removed treatment design (modified ABAB single-subject design).

Week 1	Week 2	Week 3	Week 4
Baseline / A	Music on / B	Music off / A	Music on / B
	Music log		Music log

Table 2. *Study Design (ABAB Single Subject Design)*

A demographic questionnaire was administered a few days prior to the four-week study. Four dependent variables consisting of positive and negative affect, self-efficacy, mental exertion, and task performance were measured at the end (Saturday) of each of the four weeks. A daily music log was also administered for each day (six days) of weeks 2 and 4 for participants to record the amount of time spent listening, their music selections (i.e., genre of music), and academic tasks in which they were engaged while listening to music. Examples of academically related tasks were “Reading assigned texts,” “Taking online quizzes,” “Creating a class project,” “Completing written assignments,” “Online group discussion,” and “Others.”

The first week of the study was the baseline week. Participants were instructed to begin studying as they would normally do—either with or without music as they chose. On the Saturday of week 1, the participants completed the four surveys of positive and negative affect, self-efficacy, mental exertion, and task performance.

For the second week of the study, participants were instructed to listen to the music as they wanted and when they wanted, while studying or engaging in any academic work. Participants used their own sources of music listening and combined a number of pieces of music classified by different genres (e.g., Classical, Alternative, Jazz, R&B, Contemporary Gospel, Traditional Hymn, Classic Rock, or Country) based on their preferences. On the Saturday of week 2, they completed the four sets of surveys and submitted the music log for six days.

For the third week of the study (music-off week), participants were instructed with the statement, “For this week (week 3), please do not listen to any music during your study and academic tasks” and were asked to confirm in the music log for week 3 that they had not listened to music any day in the music log for week 3. On the Saturday of week 3, they completed the four surveys again.

For the fourth week of the study (music-back on), participants were instructed to listen to the music as they wanted and when they wanted, while studying and engaging in any academic work. Participants used any source of music listening and combined a number of pieces of music classified by different genres based on their preferences. On the Saturday of week 4, they completed the four sets of surveys and submitted the music log for six days.

Measures

Participant demographic questionnaire. A researcher-designed questionnaire requested information concerning age, gender, occasions for music listening, music preferences (i.e., genre of music), and amount of time spent on daily music listening.

Positive and negative affect. The level of participants' positive and negative affect during each week was measured by the Positive and Negative Affect Schedule (PANAS) scales (Watson, Clark, & Tellegen, 1988). PANAS is composed of both positive and negative affect responses within two 10-item mood scales rated on a 5-point Likert scale (1 being very slightly or not at all to 5 being extremely) the extent to which participants had experienced each mood-state during a specified time frame. In the present study, the following instruction and time frame were used: "I have used PANAS with the following time instructions (You have felt this way during the past week)." The PANAS scale has been found to be sufficient with coefficients ranging from 0.84 to 0.90 (Watson & Tellegen, 1989).

Self-efficacy. Participants' perceived self-efficacy was measured by the Generalized Self-Efficacy (GSE) scale; (Schwarzer & Jerusalem, 1995). A 10-question test scored on a 4-point Likert scale was used to obtain individual online students' belief (i.e., self-concept) in his or her ability to accomplish the weekly academic tasks well. The Generalized Self-Efficacy scale (GSE) has been tested for internal consistency and found to be sufficient with Cronbach's alpha of 0.86 (Scholz, Gutierrez-Dona, Sub, & Schwarzer, 2002).

Mental exertion. Ratings of the participants' Perceived mental Exertion (RPE) were obtained to understand how studying, with or without music, positively or negatively affected online students' mental effort. RPE measures perceived exertion on a one-item scale ranging from 6

(no exertion at all) to 20 (maximum exertion) with corresponding descriptors of academic task intensity. RPE is highly correlated with heart rate and several other physiological measures of exertion and has been found to be sufficient with Cronbach's alpha ranging from 0.80 to 0.90 (Borg, 1982).

Task performance. The Quality of Work Questionnaire (QWQ) and Time-on-Task questions developed by Lesiuk (2005) were modified and used to measure self-perception of how well participants perform academic tasks involved in the online course work during each week. The QWQ items consisted of responding on a Likert scale (1 = not at all, 2 = somewhat, 3 = moderately, to 4 = very much so) to questions assessing academic/online learning task performance. Participants self-assessed their work quality by responding to items such as “In completing the task, was your performance effective? Was your performance creative? Did you experience fewer mental blocks than usual in the learning and performing task process? Did you use a new approach in your study and task performance? Are you pleased with the task you just completed?” Items were positively scored, summed, and then divided by 5 to obtain a mean. The higher the score, the higher the work quality (Scores could range from 5-20.)

Results

A repeated measures ANOVA was conducted to evaluate the effects of daily average music listening on positive affect, negative affect, self-efficacy, mental exertion, and task performance at different time points. These affects were measured for four weeks each (week 1, week 2, week 3, and week 4).

Positive Affect

A repeated measures ANOVA with a Greenhouse-Geisser correction showed that there was a marginally significant effect of daily average music listening on positive affect between time points $F(2.29, 94.25) = 2.82, p = .058, \eta^2p = .064$. Follow-up comparison using the Bonferroni post hoc test (see Table 3 & Figure 1) showed there was a slight, but statistically insignificant ($p = 1$), reduction in positive affect scores from week 1 ($M = 36.86, SD = 6.3$) to week 2 ($M = 36.31, SD = 8.1$).

Although again statistically insignificant ($p = 0.29$), when week 2 ($M = 36.31$, $SD = 8.1$) is compared to week 3 ($M = 33.93$, $SD = 8.1$), there was a reduction in positive affect scores. A significant increase in positive affect scores only occurred from week 3 ($M = 33.93$, $SD = 8.1$) to week 4 ($M = 37$, $SD = 7.7$, $p = .022$).

Comparison	Mean Difference	Std. Error	95% Confidence Interval of Mean Difference	
			Lower Bound	Upper Bound
Week 1 vs. Week 2	0.55	1.47	-3.53	4.62
Week 2 vs. Week 3	2.38	1.07	-5.83	5.35
Week 3 vs. Week 4	-3.07*	1.00	-5.84	-0.31

* significant α at = 0.05

Table 3. *Bonferroni Comparison for Week of Positive Affect Mean Scores*

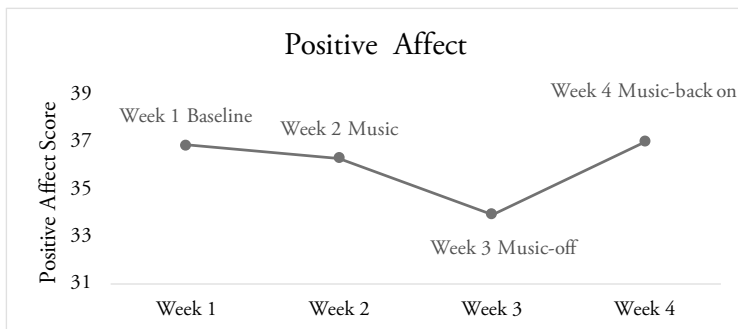


Figure 1. *Positive Affect across four weeks. The line graph shows the average mean scores of positive affect for online learners*

Negative Affect

The results of the repeated measures ANOVA indicated that there was a significant effect of daily average music listening on negative affect between time points, Wilks' Lambda = (.704), $F(3, 39) = 5.47$, $p = .003$, $\eta^2p = .296$. Using the same Bonferroni post hoc test for follow-up (see Table 4 and Figure 2) revealed that there was no significant difference in negative affect scores from week 1 ($M = 15.76$, $SD = 5.8$) to

week 2 ($M = 15.83, SD = 5.5, p = 1$). From week 2 ($M = 15.83, SD = 5.5$) compared to week 3 ($M = 17.43, SD = 6.4$), there was a considerable increase in negative affect scores, although the result was not statistically significant ($p = .82$). Finally, there was significant decrease in negative affect scores from week 3 ($M = 17.43, SD = 6.4$) to week 4 ($M = 13.64, SD = 4, p = .001$).

Comparison	Mean Difference	Std. Error	95% Confidence Interval of Mean Difference	
			Lower Bound	Upper Bound
Week 1 vs. Week 2	-0.07	0.98	-2.78	2.64
Week 2 vs. Week 3	-1.60	0.83	-3.88	0.69
Week 3 vs. Week 4	3.79**	0.92	1.24	6.34

** significant α at = 0.05

Table 4. *Bonferroni Comparison for Week of Negative Affect Mean Scores*

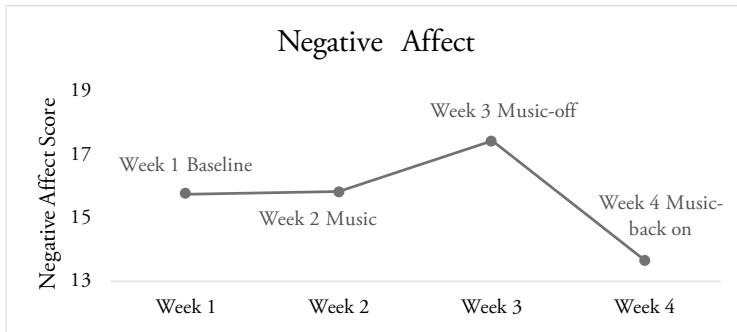


Figure 2. *Negative Affect across four weeks. The line graph shows the average mean scores of negative affect for online learner*

Self-Efficacy

A one-way repeated measures ANOVA test showed that there is no significant effect of daily average music listening on self-efficacy between any of the time points, Wilks' Lambda = (.871), $F(3, 39) = 1.92, p = .142, \eta^2p = .129$.

Mental Exertion

The repeated measures ANOVA utilization indicated that there was a significant effect of daily average music listening on mental exertion between time points, Wilks' Lambda = (.738), $F(3, 39) = 4.61$, $p = .007$, $\eta^2p = .262$. However, Bonferroni post hoc test (see Table 5 and Figure 3) revealed that the only statistically significant increase in mental exertion scores occurred from week 2 ($M = 13.60$, $SD = 2.7$) compared to week 3 ($M = 14.74$, $SD = 3.3$, $p = .015$). There was a slight decrease in mental exertion scores from week 1 ($M = 14.19$, $SD = 2.9$) to week 2 ($M = 13.60$, $SD = 2.7$), and no statistically significant difference in mental exertion scores between week 3 ($M = 14.74$, $SD = 3.3$) and week 4 ($M = 14.26$, $SD = 3.5$, $p = .55$).

Comparison	Mean Difference	Std. Error	95% Confidence Interval of Mean Difference	
			Lower Bound	Upper Bound
Week 1 vs. Week 2	-0.60	0.32	-0.30	1.49
Week 2 vs. Week 3	-1.14*	0.35	-2.12	-0.16
Week 3 vs. Week 4	0.48*	0.8	-0.29	1.24

* significant α at = 0.05

Table 5. Bonferroni Comparison for Week of Mental Exertion Mean Scores

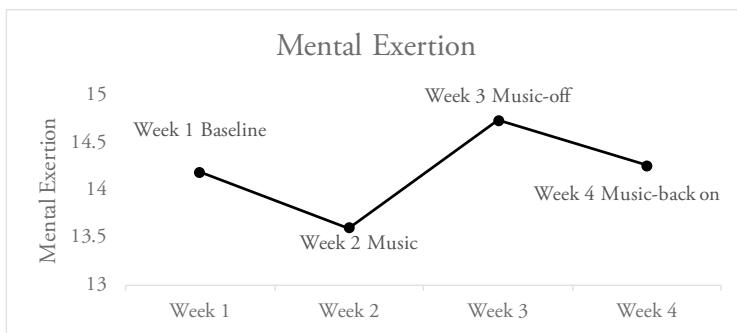


Figure 3. Mental Exertion across four weeks. The line graph shows the average mean scores of mental exertion for online learners

Task Performance

A one-way repeated measures analysis of variance indicated that there was a significant effect of daily average music listening on task performance between time points, Wilks' Lambda = (.816), $F(3, 39) = 2.94$, $p = .045$, $\eta^2p = .184$. Bonferroni post hoc test showed (see Table 6 and Figure 4) that there was no statistically significant difference in test performance scores from week 1 ($M = 13.57$, $SD = 3.3$) to week 2 ($M = 14.48$, $SD = 3.1$, $p = .61$) whereas there was a statistically significant decrease in task performance scores from week 2 ($M = 14.48$, $SD = 3.1$, $p = .61$) compared to week 3 ($M = 13.12$, $SD = 3.03$, $p = .030$). However, there was no statistically significant difference in task performance scores between week 3 ($M = 13.12$, $SD = 3.03$) and week 4 ($M = 13.71$, $SD = 2.6$, $p = .77$).

Comparison	Mean Difference	Std. Error	95% Confidence Interval of Mean Difference	
			Lower Bound	Upper Bound
Week 1 vs. Week 2	-0.91	0.54	-2.40	0.59
Week 2 vs. Week 3	1.36*	0.46	0.87	2.63
Week 3 vs. Week 4	-0.60*	0.38	-1.66	0.47

* significant α at = 0.05

Table 6. Bonferroni Comparison for Week of Task Performance Mean Scores

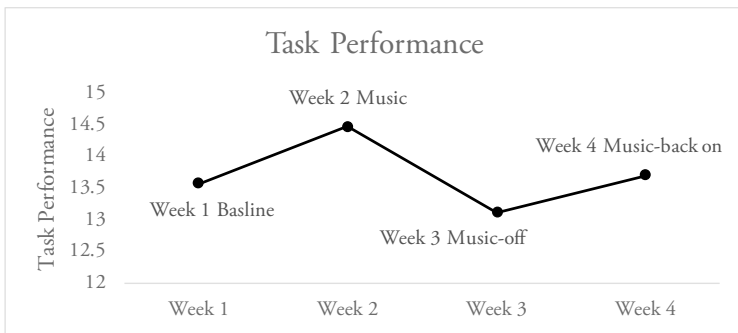


Figure 4. Task Performance across four weeks. The line graph shows the average mean scores of task performance for online learners

Discussion

Music Listening on Positive and Negative Affect

The results of the study indicate that listening to preferred music influenced positive and negative affect in online students during specific weeks of the study. Positive affect was decreased during the music-off week (week 3), but significantly increased during the following music-back-on week (week 4). Negative affect was increased during the music-off week (week 3), but significantly decreased during the following music-back-on week (week 4). Positive affect was described with the adjectives including “Interested,” “Excited,” “Strong,” “Alert,” “Inspired,” “Enthusiastic,” “Proud,” “Determined,” “Attentive,” and “Active.” Negative affect was described with the adjectives including “Distressed,” “Upset,” “Irritable,” “Ashamed,” “Nervous,” “Guilty,” “Scared,” “Hostile,” “Jittery,” and “Afraid” (Watson, Clark, & Tellegen, 1988). The results of the present study suggest that music may eliminate the negative affect including anxiety, tension, and stress in online students while they are studying for the online course or engaging in academically related tasks. The findings of the present results also indicate that mood is improved by music listening as part of online learners’ everyday life.

While not necessarily focusing on online students, a number of research studies support these new findings. Blood and Zatorre (2001) conducted several brain imaging studies using PET and fMRI, and indicated that preferred music listening stimulated the neural areas of brain reward circuitry by activating pleasure centers and deactivating the brain structures associated with negative emotions in the limbic system. Lesiuk (2000) reported decreased levels of state anxiety when music was used prior to and throughout a computer programming task. Knight and Rickard (2001) indicated that listening to soothing music diminished the subjective and physiological stress levels in college students during the preparation of their oral presentation task. Lim (2008) found that a significant effect of music listening decreased tension arousal in college students. Music may serve as an anxiolytic treatment, that is, an anxiety preventative or anxiety reducing stimuli (Lesiuk,

2010; Lim, 2008). In addition, music listening is an adequate source of mood regulation, energetic arousal, comfort, and focus for productive work (Lesiuk, 2010).

Music Listening and Perceived Self-Efficacy

The results of the study did not indicate any significant relationship between music listening and perceived self-efficacy in online students. Contingent on contextual factors (Bandura, 1997) and varying accordingly based on a person's coping capabilities in different situations (Lim & Befi, 2014), multiple external (i.e., environmental) and internal factors might be involved in one's self-efficacy. Daily listening to music might be one of the various factors; however, its sole influence on self-efficacy was not found in the present study. The Generalized Self-Efficacy Test (GSE) was designed to assess a general sense of perceived self-efficacy regarding coping mechanisms and adaptation skills. This tool was designed to measure outcome expectancy, which is defined as the belief that one's actions are responsible for successful outcomes (Schwarzer & Jerusalem, 1995). Listening to music may affect an online learner's short-term mood; however, it does not have enough potential or adequate quantity/quality of cognitive schemata to make an impact on his or her coping mechanisms and adaptation skills in terms of the successful outcome expectancy as indicated by the lack of significance in this study. Perceived self-efficacy may represent an optimistic sense of personal competence that seems to be a pervasive phenomenon accounting for motivation and accomplishments in online students even though our results did not show the relationship between music listening and perceived self-efficacy to be significant.

Music Listening and Mental Exertion

The results of the analysis indicate that music listening affected perceived mental-exertion in online students while they were engaged in academically related tasks. However, a significant increase in mental exertion only occurred during the music-off week (week 3). Those students rated the level of effort they put forth in order to complete the

study and/or academic tasks as “somewhat hard” during the music-on week (week 2), and “hard” during the music-off week (week 3). Interestingly, the participants’ mean rating of the mental exertion level was slightly decreased during the music-back-on week (week 4); however, the difference was not statistically significant. A couple of factors can be speculated: as the online course was continued week after week, the course materials and complexity might have increased. Moreover, those students might have felt more pressure to complete the academic tasks such as online quizzes or tests, participating in online discussions, and online course assignments. Therefore, their ratings of the perceived mental exertion during the music-back-on (week 4) did not yield significant changes compared to the ratings during the previous two weeks (week 2 and week 3).

Dyrlund and Wininger (2008) examined the effects of music preference and exercise intensity on exercise enjoyment, perceived exertion, and attentional focus. The authors found that the most preferred music condition resulted in the highest levels of enjoyment. The results of the study, however, indicated that there were no differences in the level of perceived exertion among those exercising while listening to preferred music, non-preferred music, or while not listening to any music (Dyrlund & Wininger, 2008). This finding suggests that the style and/or preference of music might elevate the exerciser’s mood; however, it is not strongly related to the exerciser’s perceived exertion and physical sensation. Potteiger, Schroeder, and Goff (2000) investigated the influence of music listening on ratings of perceived exertion (RPE) during 20 minutes of moderate intensity exercise. Participants were randomly assigned to the conditions of fast upbeat music, classical music, self-selected music, and no music. Potteiger et al. (2000) indicated that each type of music resulted in a reduced level of perceived mental exertion when compared with the no-music condition. The results suggested that different types of music are associated with RPE.

Lim, Miller, and Fabian (2011) investigated the effects of music on self-perceived fatigue and self-perceived mental exertion at the time of highly demanding sensory motor tasks. Music condition resulted in significantly less perception of fatigue and mental exertion levels than no music condition. However, the findings in the previous research studies

examining the effect of music on perception of exertion and fatigue level during task performance are not consistent (Boldt, 1996; Dyrland & Winiger, 2008; Edworthy & Waring, 2006; Lim, Miller, & Fabian, 2011; Potteiger, Schroeder, & Goff, 2000). The results of the present study support the findings of the present study indicating that music listening might reduce mental exertion levels of online learners.

Music Listening and Self- Assessment of Task Performance

Music elevates the listener's mood, and, in turn, positive moods enhance cognition (Ashby, Isen, & Turken, 1999; Lesiuk, 2005; 2010). Sloboda and O'Neill (2001) suggested that music experiences increased positivity, alertness, and focus on the present cognitive tasks. Edworthy and Waring (2006) reported that a higher positive affect was observed during the music condition in comparison to the no music condition and that fast, loud music might be played to enhance the assigned exercising tasks. These studies might provide evidence that there is greater integration or perceptual advantage among stimuli (i.e., learning materials or tasks) and that music induced positive affect in people.

The results of the present study indicate that the music listening during studying and engaging in academic tasks increased the self-assessment scores of task performance in online students. While, significant improvement only occurred in week 2, preferred music listening induced positive affect and heightened arousal, and that, in turn, led to perceiving improvements in task performance. From basic technological tasks to academic content acquisition to completing course assignments, preferred music listening appeared to enhance perceived task performance in online students. Participants' ratings of task performance were significantly lower during the music-off week (week 3) compared to the task performance scores of the music-on week (week 2). The participants' self-assessment scores of task performance were slightly increased during the music-back on week (week 4) after the music-off week; however, the difference was not statistically significant. A very similar pattern of score changes was observed in the results of the self-report for the task performance and the mental exertion across the three weeks:

music-on, music-off, and music-back on.

The strong positive effect of music listening during the music-on week (week 2) was not found during the music-back-on week (week 4) for both ratings of mental exertion and self-assessment of task performance in online students. Factors including increased amount of course work, studying materials with an increased level of complexity, and a higher volume of assignments could negatively influence both perceived mental exertion and task performance in those online students as the online course continued and progressed.

Limitations and Future Research

Several limitations, including the relatively small sample size, might have affected the quality of this study's results. Although the large effect sizes indicated a powerful influence of preferred music listening upon positive and negative affect, mental exertion, and self-assessment of task performance within our sample based on Cohen's effect size guidelines (1988), this current study's results should be generalized with caution to other online student populations. This limitation could be improved upon by replicating this project over the years as an ongoing research study with a relatively consistent data collection method, which would allow expanded sample size and increased generalizability of the study results. Nevertheless, the use of a conservative research design and statistical procedures with careful fidelity helped ensure the validity of this study.

A potential threat to validity was the increasing complexity of materials in the online course that were, by time, not only more complicated but also more demanding. This threat could have interfered with study participants' mental exertion and their perception of task performance. Another possible threat to validity was repeated measurements on the same tests from a relatively small number of participants. Taking the same test repeatedly within a limited time could create a testing practice effect, which means our findings could have resulted from the familiarity with the repeated measurements rather than music listening. For that reason, these internal validity threats have limited this investigation with Type I errors, and also may have led to an increased risk for Type II errors.

Detailed examination of the other dimensions of affect or mood with a larger sample could indicate particular differences in the affect change and mood regulation and further constructs relevant to motivation. Music appears to be an effective medium for inducing and sustaining (at least for a week) positive mood and diminishing negative mood including mental exertion. More empirical evidence is needed to ensure the beneficial use of music for mood alteration, mental exertion regulation, quality of work, and task performance in online learning environments with the consideration of motivation in the online students. Augmented understanding of music's effect on learning and task performance will facilitate the strategic use of music for students to reach their goals.

Thus, according to this research, listening to preferred music did increase positive affect and decrease negative affect, including mental exertion in online learners. A beneficial effect of music on online students' self-assessment scores of task performance (i.e., quality of work) was found in the present study, and it may be explained by increase in their positive affect. Music evoked a pleasant mood and an increased energetic arousal state in online students at the time of study and while they were engaging in academically related tasks. Furthermore, those students perceived less mental exertion and rated the level of their task performance higher during the time of music listening compared to the time of not listening to music. These findings of the present study suggest the preferred music listening to improve online students' satisfaction and well-being. Although there was no statistically significant difference in self-efficacy scores between the times with music and without music, the finding of the present study might provide useful resources for future investigations exploring the effect of music on self-efficacy and motivation level in online learners. We hope that this research encourages personnel involved in online education who work with online students to ensure students' satisfaction and to aid students to reach their goals through the optimal online learning experiences.

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Dr. Hayoung Lim is director of the music therapy program/clinic, and a professor of music at Oral Roberts University. She received master's degree in both cello performance and music therapy from the Illinois State University, and PhD in music therapy from the University of Miami. Dr. Lim is an active researcher with specialized training in the Rational Scientific Mediating Model for research in music therapy. Dr. Lim's research focuses on the effect of music on children with Autism Spectrum Disorders, the effect of musical experiences on cognition, speech/language and physical rehabilitation, and student development in higher education.

Eun-Jun Bang, Ph. D., is an associate professor of social work at Northeastern State University. He received his master's degree from Washington University in St. Louis, and a Ph.D. in social work from University of Missouri-Columbia. His research interests include curriculum development, online education, mental health, multicultural social work practice, and domestic violence.