CHAPTER VI
DISCUSSION

Living with cancer is an existential challenge and has major effects on the patients and their families (Vinayak & Rani, 2010). As suggested by Stanczyk (2011), the new modern cancer care has given new direction to new trends of integration and holistic thinking. The idea that cancer patients may benefit from music led to musical experience being supported by music therapy researches. Music therapy can help patients to cope with their negative emotions, and it can also be used to help patients in a complex way. Music is a major and exceptional form of art that affects people physically, sympathetically and faithfully (Rykow, 2008). Patients undergoing chemotherapy and radiotherapy often experience serious complications such as infection, anemia or internal bleeding, and short-term side effects including nausea, vomiting, fatigue, loss of appetite, hair loss and skin reactions (NCI, 2013).

Music therapy is an effective intervention method having a general impact on the psyche of the individual. But very few studies have so far focused on the comparison between the active and receptive music therapy and its effect on cancer patients. Therefore, this research attempts to give a broad outlook by distinguishing and focusing on specific type of music therapies and their successive impact on some psychological variables in cancer patients.

The aim of the present investigation was to study the effect of music therapy on anxiety, pain, fatigue, sleep quality and affect, among oncology inpatients. The sample for this study included female and male patients, who were diagnosed with cancer for at least six months, were hospitalized and underwent chemotherapy or radiation therapy. Final participants after dropouts were 184 cancer patients, who took part in this experimental research. They were randomly assigned into three groups (i.e., control group, receptive music therapy group and active music therapy group).

The dependent variables were measured over two time interval points, initially at the beginning of the study before intervention i.e. pre-test phase and subsequently
at the end of the ten sessions intervention i.e. post-test phase. The control group only received traditional treatment during the music therapy sessions. The study, therefore, presented a comprehensive picture of the influence of different types of music therapies among cancer patients. Mean, standard deviation, t-test, analysis of covariance (ANCOVA) and post-hoc analysis were applied. The results of ANCOVA and t-test clearly revealed the reduction of anxiety, fatigue, pain and increase in sleep quality in cancer inpatients. To study the differences among the patients studied, the analysis of covariance (ANCOVA) was performed, keeping the scores on the pre-test as a covariate to ‘control’ the pre-existing differences between the groups.

Music is a unique treatment that may be used successfully in a biopsychosocial model for cancer care. Clinical music therapy identifies the benefits of music to cancer patients in meeting physical, psychological, and social needs. As described by Burns, Azzouz, Sledge, Rutledge, Hincher and Cripe (2008), therapeutic uses of music may include receptive method (music listening) and active method (singing, playing, composing, moving, dancing) interventions when addressing goal areas.

Music therapy specialists presently consider and review anxiety in a range of clinical situation involving terminal disease (Gadberry, 2011; Bronner, Nguyen, Smets, Ven & Weert, 2018); transplants and music listening (Wu et al., 2017); pregnancy and delivery (Chang, Chen & Huang, 2008); pre-operative anxiety (Aghdam, 2018) and inpatient psychiatry (Choi, Lee & Lim, 2008). According to the bio-psychosocial model, music may affect physical functioning of cancer patients, including perceived pain (Mondanaro, Homel, Lonner, Shepp, Lichtenszttein & Loewy, 2017; Kim, Loring & Kweekkeboom, 2017; Fitzpatrick, Edgeworth, Moss & Harmon, 2018), stress (Pelletier, 2004; de la Torre-Luque, Díaz-Piedra & Buela-Casal, 2017), nausea and emesis (Buehler, Spielmann, Buehrer, Schmidt, Weiss & Schmitz, 2017), fatigue (Johnson & Shelby, 2016; Ji & Jo, 2017), perception of disability (Siedlecki & Good, 2006), and immune system functioning (Burns, Harbuz, Hucklebridge & Bunt, 2001).
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Anxiety

The findings of the present investigation supported the hypotheses (H1), which stated: active music therapy as compared to the pre-therapy condition is effective in the reduction of anxiety in cancer patients.

t-test results clearly revealed reduction in anxiety as a result of active music therapy. Several studies supported the efficacy of active music therapy to reduce anxiety in a medical context (Pacchetti, Mancini, Aglieri, Fundarò, Martignoni & Nappi, 2000; Choi, Lee & Lim, 2008; Tan, Yowler, Super & Fratianne, 2010).

The instructive disciplines of music therapy have many options for decreasing anxiety and a few subspecialties that focus on this purpose (Gutiérrez & Camarena, 2015). As it is found in present study, Davis, Gfeller and Thaut (2008) in their research also described that listening, playing, composing, moving and singing music are all interventions employed by music therapists. Specifically to the medical or surgical treatment area (such as chemotherapy and radiotherapy), music can be used with relaxation techniques to promote deep breathing and reduced anxiety.

In some other previous studies of music therapy intervention, it was reported that active music therapy could reduce anxiety. For example, Sung, Lee, Li and Watson (2012) used percussion instruments with familiar music and in another investigation Park and Park (2012) used music therapy as a parallel intervention with medical treatment to reduce anxiety. In the present study, active music therapy in cancer patients undergoing chemotherapy or radiotherapy as well as receptive music therapy was used. However, a possible explanation of the positive effect of active music therapy sessions is that when we use the intense movement of the body in creative form, we are promoting the release of physical and psychological tension, thus reducing anxiety.

Music therapy is considered as an effective tool in uncovering and working through the fears and the anxieties related to death and mourning. Updike (1990) examined the effects of the music for the anxieties, stress, and the experience of pain. There were significant decreases in the mean arterial pressure, systolic, and diastolic blood pressure, which are the indicators of the increased anxiety, after listening to
music. Comments from the subjects regarding their experience of listening to music what included diminished, increasingly manageable, or absent pain.

The findings of the present investigation (t-test) supported the hypothesis (H7), which stated: receptive music therapy as compared to the pre-therapy condition is effective in the reduction of anxiety in cancer patients.

t-test results clearly revealed reduction in anxiety as a result of receptive music therapy. Similar to the present study, several studies have compared the baseline measurements in pre-test to the measurements in post-test and showed similar results. However, differences in population samples, length of time using the music interventions, and differences in variables (e.g., use of control groups) make comparisons difficult (Lin, Lin, Huang, Hsu & Lin, 2011; Simavli, Gumus, Kaygusuz, Yildirim, Uslugullari & Kafali, 2014; Palmer, Lane, Mayo, Schluchter & Leeming, 2015; Bidabadi & Mehryar, 2015; Krishnaswamy & Nair, 2016; Ramirez, Planas, Escude, Mercade & Farriols, 2018).

According to previous researches, patients-preferred music listening in receptive music therapy contributes to lower anxiety level, which is in the line with our hypothesis (H7) that stated receptive music therapy in which patients had the option to choose their favorite songs is effective in reduction of anxiety. In a study by Stratton and Zalanowski (1984), 36 college students were asked to listen to music. Afterwards the researcher asked them a variety of questions dealing with relaxation and music preference. The researcher found that the subjects who liked the music the most, significantly showed less anxiety and were more relaxed than the participants who liked the music the least. So this idea that the patients select the songs that can be played for them in receptive music therapy can be helpful to increase the effectiveness of receptive music therapy. This can also apply in active music therapy by giving the patients a chance to choose the instrument and the song that they want to be trained for either playing or for singing.

Walworth, Rumana, Nguyen and Jarred (2008) also explained that patient’s preferred receptive music therapy can also be used to relieve anxiety, and the
interventions can consist of either live or recorded compositions. The results of their investigation are congruent with current study.

The results of the present research are also consistent with the findings of Tsai Chen, Chung, Liao, Chi and Chang’s (2014) meta-analysis that have reported a significant decrease in cancer patients’ anxiety after music intervention. Likewise, in another study by Das et al. (2016) in breast cancer patients undergoing modified radical mastectomy had a significant reduction in anxiety after listening to music.

Beck (1964) identified one of the cognitive errors that can be associated with anxiety as over-estimation of the actual risk. Many other dysfunctional cognitive processes also seem to be associated with the arousal of anxiety. Even when real risk exists, these types of thoughts can prevent optimal coping. Another common error is repetitive thoughts about danger. Considering that music improves the assessment of memories connected with troubles and difficulties of life history, in the present investigation patients preferred receptive music therapy was used to encourage and stimulate the manifestation of memories and emotions. Processing these memories and emotions in the determination step can enable cognitive changes and adjust the irrational feelings and attitudes. Such cognitive benefits may encourage an individual’s ability to manage conflicts, which is possibly what Dobson mentioned to as cognitive rearrangement in CBT (Dobson & Dozois, 2010).

In a study by Castelano (2010), on the effect of music therapy sessions, in the final interview with patients, they stated that the psychotherapeutic progress enhanced them in empathy, security, self-esteem and alternative implements to use in states of anxiety, consequently letting them to influentially manage conflicts. This may reasonably lead to reduce the level of anxiety.

The findings of the present investigation (t-test) supported hypothesis (H13) and (H19) which indicated: active music therapy and receptive music therapy as compared to the no-therapy (control group) is effective in the reduction of anxiety in cancer patients.

A glance at t-test, ANCOVA and post-Hoc revealed that both music therapy methods as compared to the control group made a difference in anxiety levels in
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oncology inpatients undergoing chemotherapy and radiation therapy. In both experimental groups patient’s anxiety levels went down after the intervention. To investigate the mechanisms behind this study’s success, one can begin with the music alone, which has been found to produce anxiety-reducing effects. According to Friedman (1998) by reducing heart rate, blood pressure and breathing rates, music provides a physiological state where anxiety cannot grow. Further anxiety is often expected to be a disruption in the nervous system; music can stimulate the relaxation response in the parasympathetic branch of the autonomic nervous system, henceforward responding the sympathetic nervous system’s ‘fight or flight’ response to a potential danger such as cancer or other chronic diseases (Friedman, 1998).

A paired-samples t-test analysis found significant difference of pre-test and post-test in anxiety among control group. It showed the level of anxiety decrease in post-test of control group. The reason behind this reduction even in absence of any music intervention can be the routine daily nursing care that the patients received and it can cause the hope of relief from the illness. According the investigation of Piccolo, Barni, Ambroso, Crocco, Giustina, Viterbo and Varetto (2016) empathic communication can reduce pain perception and anxiety in patients implanted central venous accesses for cancer therapy. As the patients in oncology unit of hospital can communicate with other cancer patients it also can be the reason of anxiety reduction in control group. Other patients may have provided social support, which helped in reducing anxiety.

Some of the earlier researches included distinctive methods, while many others showed crossover designs and compared a music therapy group to a placebo group as a control group. In the research of Szilagyi (2014), receptive music therapy applied as listening to the recorded music that was played by MP3 player for every individual by headphone (as in case of present study in receptive music therapy group). In his study, second intervention group participants, received recorded positive suggestions. The comparison of results showed that the second intervention group had most significant decrease in anxiety and length of ICU stay. This study did not show a detrimental impact of music on the participants, which is highly relevant for clinical practice. The result of Szilagyi (2014) study is in line with the present
A study by White (1999) revealed that patients recovering from myocardial infarction who listened to music in a restful environment experienced greater cardiac autonomic balance as measured by decreased heart rate, respiratory rate and myocardial oxygen demand when compared to those who experienced only a restful environment or standard care.

The results of this study, support hypothesis (H25) that was framed and it was hypothesized that cancer inpatients, receiving active music therapy will show greater decrease in anxiety accompanied to receptive music therapy and control group. It is also proved in Post-Hoc analysis results.

The overall picture, which emerged from ANCOVA, revealed that the active music therapy group has shown maximum reduction of anxiety as compared to the control and receptive music therapy group. The reasons for anxiety in cancer patients may be owing to psychological concerns which effect the patient as much as physiological phenomena. It has been observed that when cancer treatment starts, anxiety and worries usually increase leading to the problems with sleeping, irritability or low mood (Stark & House, 2000).

There is a considerable lack of literature on direct comparisons between the efficacy of active and receptive music therapy techniques; however, a few are listed below.

The study of Guetin et al. (2009) on 34 patients with traumatic brain injury established that the music therapy presented significant results by using both active and receptive techniques. Active music therapy sessions based on playing instruments and singing, were able to arouse both cognitive functions (concentration, memory, etc.) and psychomotor functions (coordination, lateralization of movements, etc.). Also, receptive therapy sessions (based on listening to music) supported an enhancement in anxiety and depression and stimulated the verbal expression of the participants.
In another study by Waldon (2001), active and receptive music therapy interventions were determined to be effective at significantly reducing anxiety in pediatric cancer patients. The results of his study are consistent with results of the present study and showed that the group receiving active music therapy reported less anxiety than the group, which received receptive music therapy and control group.

In contrast to receptive music therapy techniques such as listening to music, active music therapy techniques include engaging the client in singing, music composition, and instrument playing. According to the American Music Therapy Association, a majority of the techniques that constitute clinical music therapy are active music therapy techniques (AMTA, 2015).

Based on fMRI and PET scan studies, active music participation engages more parts of the brain than does music listening alone. In addition to the subcortical and cortical areas of the brain that music listening activates, music participation also engages the cerebellum, basal ganglia, and cortical motor area (Yinger & Gooding, 2014).

Mandler (1984) theorized that arousal of the sympathetic branch of the ANS results when an actual event conflicts with what was anticipated. Cancer can certainly be understood as unexpected occurrences. The incongruence between what is expected and what is real can promote qualities of anxiety such as increased breathing, heart rate, and blood pressure. Dissimilarly, preferred music delivers the expected. Pleasant and familiar melodies, rhythmic patterns and lyrics of a song may provide a welcome contrast to trauma when one receives that which is anticipated, thus restoring balance to the ANS (Thompson, 2009).

In a study by Palmer (2014) anecdotal data was provided by patients on the day of surgery after discharge criteria was met and provides insight into the reasoning behind the success of the intervention. Testimonies from subjects in the two experimental groups reveal several things. Comments such as: “The music worked for me” expose the nature of the music therapy intervention to allow patients to feel special and important at a crucial time.
The selection of music that patients listened to during receptive music therapy, and instruments that they played or the song that they sung during active music therapy differed throughout the studies. White (1999) in his study indicated that patients in coronary care unit who received three sessions over a two-day period of receptive music therapy in a relaxing environment, as compared to the control group who just received standard care, showed lower cardiac complications, by showing reduction in their heart rate, breathing rate. And these lead to reduction of their anxiety level. In the present investigation by applying ten sessions of patients preferred music, the patients show reduction in anxiety that can be resulted by reduction in their heart rate and breathing rate as in above mentioned study.

In accordance with the theory stated by Mandler (1997) when an authentic confrontation happen that is in conflict with what is predictable, stimulation of the sympathetic branch of the Autonomic Nervous System (ANS) will happen. Certainly cancer diagnosis is one of the events that can be stated as unexpected incidences in an individual’s life. The contradiction between the anticipated future and what occurs in real life, can approve signs of anxiety such as change in breathing, increase in heart rate and blood pressure.

Thompson (2009) in his study showed that dissimilarly, patients preferred music brings the expected, pleasant and impressive melodies, rhythmic forms and lyrics of a song may deliver a welcome gap to trauma when one receives that which is expected, thus rebuilding balance to the ANS.

The reason why those patients who received active music therapy, experienced more reduction in anxiety as compared to receptive music therapy, may be due to the additional and special command and control for playing instrument that they received during active music therapy. A study by Richards (2007) disclosed that music therapy not only decreases patient’s anxiety, but also clarifies how reduction of anxiety and gratification is related to the connection made between the health care provider and the patient. This is also reported in this trial that music therapy helps in improving relationships between patients and staff and increasing patient’s satisfaction as secondary improvements through interventions that alongside reduce the level of anxiety.
The results of present study support applying the music therapy for cancer patients in the hospital environment, especially in chemotherapy and radiotherapy units. Researches in music therapy have given several techniques that have proven to be effective in reduction of anxiety that lead to relaxation. Some of the techniques used are: use of music alone, progressive muscle relaxation, use of music in conjunction with other relaxation methods, live music and patients involved in music making by instruments, singing or dancing.

Davis and Thaut (1989) established that musical stimuli, when perceived as pleasant and relaxing could enhance the psychological process of relaxation in wellness programs in variety of clinical populations.

Furthermore, anxiety is relieved as the sympathetic autonomic nervous system is regulated in the adrenal medulla, which reduces the circulation of adrenaline and noradrenalin, thus benefitting the cardiovascular system, among others. Additionally, the hormonal regulation of the hypothalamic–pituitary–adrenal cortex axis decreases the circulating stress hormones such as cortisol, which benefits, among others, the immune system. The aforementioned are among the changes and beneficial effects in a complex physiological and immunological cascade, which, for most patients, can reduce somatic symptoms of anxiety such as tachycardia and high blood pressure, hypersensitivity to pain, gastrointestinal disorders, and sleep disturbances, among others along with brain and mental functions, such as memory, attention; and the functioning of the affective system gets enhanced (Szirmai, 2011).

Another reason why those who received personalized receptive music therapy and those who were given individual active music therapy, experienced an overall reduction in anxiety may be due to the extra and unique care they received in the hospital area during chemotherapy or radiotherapy sessions.

One of the most important characteristics of music is that it can reduce tension and anxiety. The mechanism of music-therapy is thought to arise from multiple nervous stimuli that are conducted in the brain, which are antagonists to each other, and under certain conditions, receiving the stimulus of hearing music can reduce pain or discomfort. Music can change the reaction of the autonomic nervous system in the
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thalamus, such as relaxing the tensive muscles, decreasing the release of adrenocorticotropic hormone, and changing the activity of the sympathetic nervous system. In addition, music influences the limbic system to evoke joyful sensations and decrease anxiety level (Daniel, 2016). Music can also stimulate the pituitary gland to release more endorphins, which reduce pain, therefore can decrease the level of anxiety, a study by Cook (1986).

A glance at t-test and ANCOVA revealed that in the present study as was expected in hypothesis (H₃₁) and (H₃₇), significant gender differences were found with males and females responding positively to the types of interventions with reduction of anxiety noticeable in both active and receptive music therapy groups. Though, in all the groups females showed a more substantial decrease in anxiety than their male counterparts. The pattern of gender differences throughout the anxiety disorders is investigated with national citizen survey in DSM-III-R (Kessler et al., 1994).

The results of this study show that women in overall samples experienced a lower degree of anxiety before the intervention as compared to men, which could have effected to lower anxiety in post-test scores also. This is incongruent with results from a study by Ersöz et al. (2010) who reported women have a significantly higher state of anxiety than men before doing colonoscopy (Ersöz et al., 2010). It can be due to the higher adjustment power of women as compared to men.

Result of a study by Björkman, Karlsson, Lundberg and Frisman (2013) that was congruent with present study showed that listening to sedative music decreased anxiety among women more than men.

This finding was significantly more dominant in women than in men. This unique finding means that women are more responsive to music specially preferred music than men. Women are more sensitive and sentimental and can be impressed and distracted more easily by music. However, this new idea that music can be more useful for women should be confirmed by more experimental and clinical researches.

In looking at the t-value and means of pre-test and post-test in control group, it is evident that the male control group showed significant difference of anxiety in post-
test. This reduction of anxiety in control group can be due to their awareness of the condition in the duration of their hospitalization. Also the routine nursing care they received in hospital and meeting other patients with similar disease can be the reason of this decrease in anxiety.

**Pain**

The findings of the present investigation (t-test) upheld the hypotheses (H$_2$) and (H$_8$) which stated: active music therapy and receptive music therapy as compared to the pre-therapy condition is effective in the reduction of pain in cancer patients.

This study found both active music therapy and receptive music therapy to be statistically significant in reducing pain in male and female cancer patients when compared to the pain levels of pre-test. The results of the current study support hypothesis (H$_2$) and (H$_8$) that claim active and receptive music therapy to show reduction of pain in post intervention scores by applying t-test.

The findings of this recent study provide to current knowledge of the effectiveness of music therapy as an intervention to decrease pain of cancer patients undergoing chemotherapy or radiation therapy. Previous studies by Bolwerk (1990) and Guzzetta (1989) recognized a connection between the use of music and decrease in pain, as measured by both subjective and physiologic signs.

The benefits of the music for the pain treatment have been well known over decades. The relation between the music and medicine emerges from the archaeological findings, such as ancient artefacts, or from biblical references, which hint that in ancient times, the powerful effects of music on physical well-being and healing were well-appreciated by Feller (2003). For example, in the Greek mythology, Gods were pioneers in using music to ease pain for surgical operations, and occasionally also for causing powerful physical and emotional states. Since ancient times, besides drugs, music was used to tempt hypnotic states, trying to provoke a beneficial effect on surgical and purely emotional sufferings (Ture et al., 2005).

This result is consistent with reports by Zimmerman et al. (1989); Bolwerk (1990); Ghaffaripour et al. (2013); Keenan and Keithley, (2015), Mondanaro, Homel, Lonner, Shepp, Lichtensztein and Loewy (2017).
Overall, the present study showed a significant reduction in pain intensity after music intervention. Findings of current study are also congruent with other studies which identified that music may help to relieve pain that may be caused by cancer itself or by cancer treatment and supports with the hypothesis (Wang et al., 2015; Zhou, Li, Li, Liu, Dang, Wang & Xin, 2015).

Previous studies on receptive music therapy can be differed into two categories based on results: studies which found no significant differences in pain (Heiser, Chiles, Fudge, & Gray, 1997; Taylor, Kuttler, Parks, & Milton, 1998) and studies which found a significant decrease in pain perception for the intervention groups (Shertzer & Keck, 2001; Good, Anderson, Stanton-Hicks, Gras, & Makii, 2002; Nilsson, Rawal, Enqvist, & Unosson, 2003; Laurion & Fetzer, 2003; Wang et al., 2015).

Sahler et al. (2003) found that blood and marrow transplantation patients reported that their pain and nausea significantly decreased after receiving music therapy sessions twice a week. The results of their investigation is in line with the present study in which two types of music therapies were used and reduction in the pain was studied. And according to participant reports, after 10 sessions of music therapy their pain significantly reduced.

As per the findings of the present study the patients in both active and receptive music therapy groups had this opportunity to choose their favourite Persian pop songs in a study by Warth, Kessler, Kampen, Ditzen and Bardenheuer (2018) the same strategy showed same result. In their study the chosen songs were associated with a close person, an important place or event or with a religious belief. The results showed medium-sized improvements with regard to life closure, well-being, relaxation, worry and pain. It can concluded that listening to their favourite songs caused memorizing the past, which can give them the hope for future life.

In present study it was concluded that preferred music was more powerful in distracting attention from pain. Iranian pop music was effective in increasing pain tolerance and decreasing pain rating comparing to no music condition. On one hand, preferred music seems to have emotional and memorial engagements with
individuals’ fond memories, thus it is more powerful in diverting individuals’ attention from pain (Mitchell, MacDonald & Brodie, 2006).

On the other hand, most of Iranian pop music are slow-beat and low frequency music. These kinds of music may raise lower levels of energy to increase pain tolerance. In present research, participants were young adults in ages between 20 to 40 years old. Most of them chose fast beat music as a preferred music that could raise person’s mood and distract their attention more easily.

A paired-samples t-test analysis found significant increase of pain in post-test among control group. Chemotherapy and radiotherapy work on active cells. Active cells are cells that are growing and dividing into more of the same type of cell. Cancer cells are active, but so are some healthy cells. These include cells in blood, mouth, digestive system, and hair follicles. Side effects happen when chemotherapy damages these healthy cells. It can cause pain in patients. Pain is the most common side effect after chemotherapy and radiotherapy. The reasons that patients in control group reported higher pain in post-test condition can be the above cited.

The findings of the present investigation (t-test and ANCOVA) supported hypothesis ($H_{14}$) and ($H_{20}$) which stated: active music therapy and receptive music therapy as compared to the no-therapy (control group) is effective in the reduction of pain in cancer patients.

According to Bozcu (2006) music is beneficial to reduce the side effects of different treatments such as pain in cancer patients. Music has ethnically and scientifically been known as an successful stimulus of emotions and a modulator of mood as described by Baumgartner, Lutz, Schmidt & Jäncke (2006); Juslin & Västfjäll (2008); Fritz et al. (2009); Bernatzky et al. (2011), and consequently, improvement in emotions and mood can be effective in pain reduction (Tommaso et al., 2008; Villemure & Bushnell, 2009).

Although the exact mechanisms of music therapy which cause the reduction of pain is not still discovered, but according to the studies by Roy et al. (2012); Hauck, Metzner, Rohlffs, Lorenz & Engel (2013), the basic and subsidiary factors of the music can effect indirectly on the pain through cognitive and emotional mechanisms.
The mechanism of palliative power of music is releasing the neurotransmitters such as dopamine that cause the regulation of autonomic system (Salimpoor et al., 2011).

In different studies, the palliative effect of music therapy with mechanisms of distraction and reward (Kringelbach, 2005), reevaluation and expectancy of pain relief (Wiech, Ploner & Tracey, 2008) was initiated.

Mitchel and colleagues (2006) noted that preferred music increase pain tolerance more effectively, which is in agreement with present study. They have reported that pain rating did not differ significantly.

Because the cancer patients in this study received pharmacologic treatment for cancer (chemotherapy and radiotherapy), comparisons with studies by Beck (1991) and Zimmerman et al. (1989) are more appropriate. These investigators deliberate pain intensity levels in cancer patients using VAS pain scales before and after the use of music intervention. These studies concluded that receptive music therapy is an effective method to reduce pain-intensity during cancer treatment.

In another study Greco (2013) found the evidence of music therapy reducing pain as well as anxiety in patients with breast cancer and suggested that is has the latent potential to help breast cancer patients as a key non-pharmacological tool.

In another study, that was consistent with present study Huang et al. (2010) showed the effectiveness of music therapy in which the participants listened to patients’ preferred music and found improvement in pain reduction significantly.

Music can reduce pain in several process such as: serve as a distracter, giving the patient a sense of control, causing the body to release endorphin to counteract pain, relaxes a person by slowing their breathing and heart beat. Present study findings are in line with results of research by Powers (2002), which showed that music cause analgesia, especially when the patients preferred song or music used in therapy.

While the mechanism behind palliative effect of music is not researched yet, but the studies by Bernatzky et al. (2011) and Hauck et al. (2013) in separate studies stated that music effect cognitively and emotionally on patients and effect on their pain perception. Distracting can be effective in moderating pain primarily through the
cognitive component of the gate control theory of pain. Attending to pleasant stimuli occupies the capacity of the information processing system, disabling the individual from fully attending to the pain-causing stimulus as described by Arora & Kurkure (2010).

As per the findings of a study by Kim, Lee and Lee (2018) Korean traditional music reduced morphine-seeking behavior induced by a priming challenge with morphine. And, the GABA receptor antagonists blocked this effect. Besides, Korean traditional indicated anxiolytic effects versus withdrawal from morphine. It can be the reason why in the present study the of pain reduction achieved after music intervention. In addition, it has also been shown that music can be used as a therapeutic modality in treatment of chronic pains and diseases (Nickel, Hillecke, Argstatter & Bolay, 2005). However some other investigators have reported that music does not have any significant effect in reducing pain experience (Ikonomidou, Rehnstrom & Naesh, 2004).

Results of present study show significant reduction in perception of pain in active music therapy group as compared to pain scores of receptive music therapy group, which was shown in ANCOVA and post-Hoc. This result support hypothesis (H$_{26}$) that expected cancer inpatients who receive active music therapy to show greater reduction in anxiety than those who receive receptive music therapy.

In this study, the pre-recorded audio music used was based on pieces selected by the subjects. Favored music was identified by the subjects and prerecorded on MP3 player. This study, like that of Melzack et al. (1963) demonstrates that pain levels may decrease by listening to music. These results of the study are also consistent with Georgiou’s (2015) study that found that patients with various diagnoses in an ICU had a decrease in pain perception after listening to anxiolytic and relaxing music.

The music style listened by the participants in this study was pop Persian music. There is a cultural belief that classical music is better to reduce pain than any other type, which was probably started or exacerbated by the so-called “Mozart effect” that is not even related to pain perception as examined by McKelvie and Low (2010).
Research hypotheses guided the review of the articles. In this study Persian pop music for receptive music therapy and guitar playing and singing for active music therapy were used to induce analgesia. Nightingale (1968) in his study mentioned that string instruments in active music therapy had positive effect on reduction of pain, these were used in several studies by Onieva-Zafra et al. (2010), McCaffrey and Freeman (2002), Guetin, Ginies, Siou, Picot, Pommié and Touchon (2012). In another study Mitchell et al. (2007) stated that classical, pop and relaxing music has an effect on reduction of pain. All of these studies found that music decreases chronic pain. Several studies found interesting result, that music had continuing effect on the patients’ pain; longer the music was daily listened to, the pain was decreased more (McCaffrey & Freeman, 2003; Onieva-Zafra, Castro-Sánchez, Matarán-Peñarrocha & Moreno-Lorenzo, 2010; Guetin, Ginies, Siou, Picot, Pommié & Touchon, 2012).

The present study found significant differences in pain perception of cancer patients who underwent chemotherapy or radiotherapy after active music therapy and receptive music therapy intervention. As proposed by the Gate Control Theory of pain, transferring the individual’s attention from pain to some other involvement is more pleasing and may change the perception of pain in patients. This is a kind of sensory excitation, which arouses closure of the gate, resulting in an interruption of the neurotransmission of the pain signal (Siegele, 1974). In this study, music therapy was applied for the patients as an auditory distraction from pain.

Lacks have been found in the anatomical and physiological aspects of gate control theory but it remains as an innovative in pain research and treatment (Koestler & Myers, 2002). Bringing concepts of control, support, and autonomy to music therapy, Robb (2003) developed a theoretical foundation concerning the contextual support model of music therapy as related to hospitalized pediatric cancer patients. This model may be applicable to the adult hospital population as well. She indicated that the three basic elements of the contextual support model were structure, autonomy support, and involvement (Robb, 2003).

The implication that can be made from this research and previous studies is that music listening lead a significant decrease in self-reported pain among the sample population studied. When given an opportunity to express additional feelings about
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the music listening sessions, subjects in this research and in Locsin's (1981) research stated that music helped to distract them from their pain. Therefore following music listening, cancer patients have a greater decrease in self-reported pain compared to the baseline reported pain. Because inflation of music depends on ethnic contextual, there is diversity of musical styles in each part of the world. Listening to music can emotionally involve an individual’s attraction and stock attention, particularly if individual’s connection with the song is strong. By this research, receptive music therapy applied by mp3 player and active music therapy is effective in relieving from the pain or changing the perception of pain cancer patients.

Clark et al. (2006) claimed when research participants have this chance to select the music, which they are listening, it can cause more reduction in perception of pain and consequently pain relief. Moreover the benefits of listening to favorite preferred music and playing music, the nature of the music has also been shown to be important in enhancing how emotionally engaging it is for patients. Mitchell et al. (2006) discovered that, patient-preferred music listening significantly improved patients' patience to pain and greater control feeling over pain.

Present study has shown that music had a distractive effect in pain feeling because attention converts from pain stimuli to a lovely and enjoyable incentive. This experimental study is supported by many other studies, which noted that music could reduce pain in clinical settings such as postoperative pains (Cadigan et al., 2001).

The present study however, was able to partially support the hypothesis (H₃₂) and (H₃₈) as significant differences emerged between males and females in active music therapy which revealed lowest scores on pain, with females, showing substantial decrease than their male counterparts.

Some studies have indicated that women reported more pain and had lower pain tolerance compared to men (Al’Absi, Petersen & Wittmers, 2002; Al’Absi, Wittmers, Ellestad, Nordehn, Kim, Kirschbaum et al., 2004; Hirsh, George, Bialosky & Robinson, 2008; Thompson, French & Davis, 2008), while some studies have reported that tolerance is higher meanwhile rating is lower in males (Jones, Zachariae & Arendt-Nielsen, 2003; Lowery, Fillingim & Wright, 2003; Kim H, Neubert, San, Xu, Krishnaraju, Iadarola et al., 2004; Jackson, Iezzi, Chen, Ebnet & Eglitis, 2005).
In some other studies, no difference between male and female in relation to pain score was found, however pain tolerance was higher in men (Zimmer, Basler, Vedder & Lautenbacher, 2003; Dixon, Thorn & Ward, 2004; Mitchell, 2006).

Fillingim et al. (2009) in their systematic review revealed that in most studies females are more sensitive to pain especially in pain tolerance and rating. Similarly, in the present study it was found that, reduce in pain perception in women was more when they were listening to their favorite music. This finding was significantly more dominant in women than in men. This unique finding means that women are more responsive to music specially preferred music than men. This findings support the theory that music can act as a distracter to reduce pain, which is commonly accepted (Nilsson, 2008).

In case of gender difference, contrary to present study, in a study by Björkman, Karlsson, Lundberg and Frisman (2013) it was reported that women experienced a higher level of pain during the colonoscopy as compared to men. Their findings are similar to another study where women reported higher pain scores compared to men during colonoscopy (Costa et al., 2010). Another study that was not in line with present study, by Ylinen, Vehviläinen-Julkunen and Pietilä (2009) stated that women who did not listen to music during colonoscopy also rated pain level significantly higher compared to men. In the present study it is concluded that music is an effective pain reducer in an experimental situation and many other studies in clinical condition support our results.

**Fatigue**

A paired-samples t-test analysis found significant differences on overall sample on total fatigue between pre-test and post-test among receptive music therapy group and active music therapy group. These results support hypothesis (H7) and (H8).

Fatigue can be confused with tiredness. Everyone gets tired. In fact, it is an expected feeling after certain activities or at the end of the day. Usually, we know why we're tired and a good night's sleep will solve the problem. Fatigue is less precise, less cause-and-effect. Fatigue is a daily lack of energy; an unusual or excessive whole-body tiredness, not relieved by sleep. It can be acute (lasting a
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month or less) or chronic (lasting from 1 month to 6 months or longer). Fatigue can have a profound negative impact on a person's ability to function and quality of life. Cancer-related fatigue (CRF) is one of the most common side effects of cancer and its treatments. It is often described as "paralyzing." Usually, it comes on suddenly, does not result from activity or exertion, and is not relieved by rest or sleep. It may not end - even when treatment is complete.

Although the quantitative results were significant, the results were consistent with those of previous music therapy researchers (Kangas, Bovbjerg & Montgomery, 2008; Goedendop, Gielissen, Verhagen & Bleijenberg, 2009) who found that interventions improve hospitalized cancer patients’ fatigue. Not much of the study research has examined the use of music therapy on fatigue with the cancer population.

The results of the present research are also consistent with the findings of Tsai et al.’s (2014) meta-analysis that have reported a significant decrease in cancer patients’ fatigue after music intervention.

A paired-samples t-test analysis found significant decrease of fatigue in post-test among control group. Considering in case of cancer, fatigue due to stress, not enough sleep, poor diet and other lifestyle factors. Hospitalizing and having enough rest, eating healthy and properly in hospital, talking to cancer care team may have helped the patients in control group to manage and reduce their fatigue.

The findings of the present investigation (t-test and ANCOVA) supported hypothesis (H15) and (H21), which claimed active music therapy as compared to the no-therapy (control group) is effective in the reduction of fatigue in cancer patients.

In an investigation consistent with present study, Ko and his colleagues (2011) studied the effectiveness of oriental medicine music therapy on a patient who had idiopathic chronic fatigue. Clinical and biochemical outcomes disclose that there is a significant rescue from chronic fatigue following music therapy sessions. The researchers therefore recommended that this therapy could be an effective alternative treatment for such type of fatigue.

Music can be used to combat tension by reversing the behavioral indicators and physiological responses of anxiety. It can cue a relaxation response by promoting
decreased muscular tension and deeper respiration which facilitates reduced muscular pressure on nerve endings and restores a stable supply of oxygen to muscle tissue. In addition, from infancy, music can have noticeably positive effects on one’s heart rate, oxygen saturation levels and respiratory rates (Pelletier, 2004).

Instrument playing constitutes movement and may further reduce aspects of fatigue because exercise interventions have demonstrated positive outcomes on cancer related fatigue (Mock et al., 2001; Adamsen et al., 2003; Kangas et al., 2008).

However, the design of the current study may lend itself to inaccuracy in perception measurements due to the synchronized measurements of pain and fatigue. Results of a research by Rosenow and Silverman (2014) showed that a single music therapy session have a slight positive effect on fatigue in cancer patients. The results of their study showed a minor reduction in fatigue from pre to post-test of participants in experimental group, and a minor increase in fatigue of participants of control group. Earlier, similarly Crawford, Hogan and Silverman (2013) have developed this design with BMT patients.

The positive result of present study is congruent with previous music therapy literature by Standley (2000), in which he indicated that music therapy can positively affect psychological symptoms in medical environment.

Moreover, Bradt et al. (2011) explicitly distinguished the lack of music therapy studies for cancer patients, particularly on variable of fatigue as a dependent measure. Present study represents an initial investigation to address this consequential gap in the literature base. Other studies that concentrate on the oncology patients on various variables would be helpful so as to growth positive approach to music therapy services.

In present study, the researcher provided music therapy in the form of patient-preferred recorded songs in receptive music therapy and in active music therapy, patients decide to sing and play one song. Previous researchers have found beneficial effects concerning patient-preferred live music (Ferrer, 2007; O’Callaghan & Colegrove, 1998; Standley, 2000; Walworth, 2003).
Additionally, in an earlier qualitative literature by O’Callaghan & Colegrove (1998) researchers found that patients tend to prefer live music interventions, especially during their initial experiences with music therapy. Researchers could explore if, as the therapeutic relationship between music therapist and patient grows, patients choose other music therapy interventions. This can be related to result of present study that showed greater effect of active music therapy.

Another study which is consistent with present study was conducted by Kwekkeboom et al. (2010), in which the findings revealed that fatigue can be lessened by music therapy, and they implied that more studies be conducted to serve as a reference for the conclusive statement on fatigue and music therapy.

In current study according to results, post-test scores of active music therapy on fatigue is significantly lower than that of control group and receptive music therapy group. That is supporting hypothesis (H27), which stated Cancer inpatients, receiving active music therapy will show greater reduction of fatigue in cancer patients.

As fatigue is commonly associated with mental and body stresses, sound and music therapy can be a mean for its management. This complementary treatment is said to be another form of language that communicates to the soul of a person; every rhythm of which touches the person’s emotions and modifies it accordingly. This therapy focuses on which music is to be use to relieve stress of the fatigued person. The mental and physical stresses are relieved through the vibrations from the beats and melody of the song, and the mental interpretation of the incorporated lyrics. These affect the release of cortisol, a stress hormone, increasing it to a more favorable level. The result is a beneficial improvement in vital signs of the person and a more vibrant being; thus the relief of fatigue (Silverman, 2013).

Music therapy may also be used as a preventive measure for tension reduction in emotional stresses that can cause reduction in fatigue (Tsenova, 1996).

In order to find out whether there is gender differences in reduction of fatigue after music intervention, the descriptive analysis and ANCOVA and post-Hoc were carried out and hypothesis (H32) and (H38) expected gender difference on post-test
scores of fatigue and it was supposed that males and females show differences in the efficacy of active and receptive music therapy in reduction of fatigue in cancer patients. The finding of present study does not reveal any significant difference among groups of males and females, thus these hypotheses were not supported. As far as available review of literature is concerned, no investigation has been undertaken to study gender difference on reduction of fatigue, in music therapy condition. There is a lack of study in this area.

In the current study, reduction of fatigue in cancer patients, may help them more actively participate in their chemotherapy or radiotherapy sessions and consequently their physical strength in their hospitalize duration will increase.

**Sleep quality**

Lack of sleep and inefficient sleep are common problems in cancer patients along the treatment stage from the point of diagnosis to end of life in all stages (Berger et al., 2005). The purpose of this investigation was to study the effectiveness of two types of music therapy on sleep quality in cancer patients under chemotherapy or radiotherapy treatment. The results of the present investigation revealed that both the techniques viz. receptive music therapy and active music therapy improve patients’ sleep quality. According to review of literature, there is lack of studies, which compare the effects of active and receptive music therapy as a psychological intervention in cancer patients. Based on the results, a significantly higher mean in the active music therapy group showed that this technique is more beneficial to improve sleep quality of individuals.

The findings of the present investigation supported the hypotheses (H₃) and (H₁₁), which stated: active music therapy and receptive music therapy as compared to the pre-therapy condition is effective in the increasing of sleep quality in cancer patients.

_t-test_ results clearly revealed improvement in sleep quality as a result of active music therapy and receptive music therapy. The previous researchers also have found that both types of music therapy are effective in increasing sleep quality (Johnson, 2003; Deshmukh, Sarvaiya, Seethalakshmi & Nayak, 2009; Chan, Chan & Mok, 2010; Vinayak et al., 2017).
Regarding the duration of music therapy intervention, Chan et al. (2010) suggested that at least four weeks of observation is required to see the effectiveness of intervention on sleep quality, but Zimmerman et al. (1996) have got the results of music therapy in just one session. The results of present study are in line with the earlier studies. In this research, music was used as parallel-therapy along with chemotherapy and radiotherapy and applied for ten sessions in ten days and the results showed significant improvement in sleep quality after ten sessions.

Lafçi and Öztunç (2015) found that music therapy positively affects the sleep quality in breast cancer patients, however, the quality of sleep in control group, which did not get music therapy decreased during the period of chemotherapy and radiotherapy treatment.

The improvement of sleep quality in patients after the music therapy might be related to the power of music to decrease stress (Lai & Li, 2011).

When considering the efficacy, music intervention seemed to offer clear advantages for adults with primary insomnia. Listening to music and music-associated relaxation are probably the best options to consider in the application of music intervention (Feng, Zhang, Hou et al., 2018).

However, these studies have only carried out receptive music therapy and they have not compared the two types of music therapy. This means that their results are limited by single therapy, but in the present study both techniques have been investigated. it can be concluded that active music therapy is more effective than receptive music therapy.

The results of the present investigation were in contradiction with research conducted by Lazic and Ogilvie (2007), as they found that music therapy did not cause any improvement in the sleep quality of individuals with or without the sleep disorder. However, no similar comparable and contrastable research with this present study is available.

In a systematic literature review of the use of music therapy to address sleep quality and sleep disorders of the 37 studies, 33 showed a positive influence of music therapy/music on sleep quality, while 4 found no impact. Six articles reported that
music therapy/music had more or equal impact on sleep quality compared to other treatments (Pan, 2017).

While the above-mentioned studies have shown that music as a therapy can improve sleep quality, however it has not suggested any specific strategy or method for applying music intervention. Hence, a protocol is needed to show the strategy for applying music therapy with particular consideration on various elements such as music-playing duration in each session, type of music and musical instrument. Furthermore, it is essential to understand which kind of ambience is required to make the suitable environment for patients. It could be added that the efficiency of these interventions depends on patients’ satisfaction (Nilsson, 2011) and the patient-preferred music is a useful method to increase the level of enjoyment and effectiveness of music therapy (Lai, 2004).

According to the results that is shown in ANCOVA and post-Hoc the hypothesis (H17) and (H23) that predicted active and receptive music therapy as compared to control group to show increase in sleep quality in post-test is supported.

The results of the present study are consistent with the results of most of the previous studies. Our findings were similar to those in the three previous studies that used qualitative (Mornhinweg & Voignier in 1995), quasi-experimental (Levin in 1998), or experimental (Zimmerman et al., 1996) approaches. In the experimental study, music was used in the afternoon rather than at bedtime when sleep was measured.

The type of music in our study was pop music. And the instrument used in active music therapy was guitar. Both active and receptive music therapy (which were given in chemotherapy and radiotherapy time) were found to be useful for sleep; active music therapy was more significantly effective.

In various studies, duration of the effectiveness of music therapy on sleep quality is different. Blanaru (2012) reported one week listening to music with relaxation was effective in improving sleep quality. Chih Kuang (2014) showed the effectiveness of listening to music for one night for an hour on the duration of deep sleep on the results of the polysomnography. Also Street et al. (2014) reported the
impact of listening to music for 30 days, 30 minutes every night before going to sleep on the Pittsburgh Sleep Quality Index. Besides Chang, Lai, Chen, Hsieh & Lee (2012) showed the efficacy of listening to music for four days, every night, before sleep by using polysomnography evidence.

The duration of intervention in the present study was ten sessions, thirty minutes each session. Although Hoch and Reynolds (1986) have suggested that three weeks are needed to observe a new intervention for sleep quality, others have found effects after 3-day (Zimmerman et al., 1996) and two-week periods (Levin, 1998). According to previous researches and present study results, the possibility of greater improvement with a longer intervention period remains to be explored.

The results can be explained by the psycho physiological theory that sleep quality can be improved by relaxing the body with sedative music, which decreases circulating noradrenaline (Gerra et al., 1998) that is related to sleep onset (Irwin et al., 1999).

Several studies conducted in clinical settings have suggested that sedative music may have positive effects on sleep via muscle relaxation and distraction from thoughts (Good, Stanton-Hicks et al., 1999; Salamon, Bernstein, Kim, Kim, & Stefano, 2003; Standley, 1986). Most of the pieces that Harmat et al. (2011) used had slow tempo and are performed on strings to aid the participants to achieve sedative and relaxed states. New age music like pop music, which we used in present study is also commonly used in sleep studies and showed similar results by Lai (2005).

The mechanism through which music listening improves sleep is still unresolved, but researchers have put out a number of suggestions and hypotheses. For example, scientists propose that the improvement in sleep could stem from the effects that music listening has on emotions and emotion-related physiology: Music listening has been connected to activation of brain areas important for pleasure and reward, and listening to soothing music has been shown to lower arousal, with subsequent decrease in heart rate and blood pressure. Another way that music may influence sleep is through altering the release of hormones. For instance, music listening has been found to increase the release of endogenous opioids and oxytocin. Oxytocin is
called the “cuddle hormone” and it is important for functions related to intimacy, reproduction and bonding. Endogenous opioids are the body’s own painkillers, functioning much like the opioids that are used in medicine. The release of these two hormones during music listening decrease stress, and experiences of physical as well as emotional pain, which may be at the root of some cases of sleep disorders (Wang, Sun & Zang, 2014).

Even though the mechanisms behind the effects of music listening on sleep quality are still unknown, anyone can already start experiencing these benefits. Music has been an intuitive way of improving sleep probably for as long as humans have had the capability to sing - in the form of a lullaby. Arousal-related mechanisms influence sleep throughout life, and a little help may be needed also as an adult for relaxing and calming down before bed (Harrison & Horne, 2000).

According the analysis of covariance (ANCOVA and post-Hoc) the results of present study supported hypothesis (H29) that predicted cancer inpatients, receiving active music therapy to show greater increase in sleep quality than those who received receptive music therapy.

Previous studies also have shown similar results and have found that active music therapy showed more psychological and physiologically effectiveness on mind and body, thus causing improve in sleep quality (Rickson & Watkins, 2003; Burns, Sledge, Fuller & Monahan, 2005). These studies were in line with current study.

According to the neuroscience perspective, receptive and active music therapy can activate different parts of the brain. Receptive music therapy is a type of passive listening to music that involves sub cortical and cortical areas of the brain. FMRI and PET scan have shown that active music therapy involves more parts of the brain than receptive music therapy (Yinger & Gooding, 2014). By participating in music therapy and playing an instrument, such as guitar in active music therapy, clients feel purposeful and confident. The involvement of individuals in playing musical instruments and singing can make their mind busy; therefore, they feel calm at the same moment. According to Gaston (1968), listening and playing music causes the feeling of “here and now”. Music can lead to the relaxation that can reduce stress and
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arousal, and cause a higher level of wellbeing and sleep quality as studied by Pelletier (2004).

As appreciation of music depends on cultural background and there is variety of musical styles in each part of the world, listening to music can emotionally engage by an individual and attracting or holding attention, especially if individual’s relationship with the song is strong. By this research, receptive music therapy applied by mp3 player (patients prefer pop music) and active music therapy (in which patients are involved in playing guitar and singing) is effective in improving sleep quality. Although sleep disorders are associated with medical conditions such as cardiovascular disease, and respiratory and musculoskeletal problems, some of these disorders are recognized in cancer patients. It seems that the mental and physical discomforts from cancer can be associated with sleep disorders; in fact, difficulty in sleeping is one of the most prominent concerns of cancer patients as examined by Davidson, MacLean, Brundage & Schulze (2002).

Evidence suggesting that there is an association between sleep and natural killer cells raises the possibility of increase in the quality of sleep being effective on the body's defense system and immunity against tumor cells. Circulating cytokine levels play an important role in regulating sleep by interacting with hypothalamic–pituitary–adrenal axis. Cytokines can lead to abnormal cortisol fluctuations. Abnormal discharge of cortisol also shortens the duration of sleep and increases sleep disorder. Consequently, cancer and its treatment (chemotherapy and radiotherapy) causes disturbance in the secretion of cytokines and leads to disorders in sleep duration, waking, and functioning of immune system as described by Sprod, Palesh, Janelins, Peppone, Heckler, Adams et al. (2010). Improvement in sleep has numerous benefits for cancer patients; among them are emotion and mood improvement, and cognitive and physical function improvement as researched by Davidson, MacLean, Brundage & Schulze (2002). In addition, touch accelerates blood circulation, helps the digestive system and its function, stimulates the lymphatic system, has a profound effect on the nervous system, relieves stress, and reduces heart rate and blood pressure. On the other hand, by causing the secretion of endorphins, it reduces pain and provides relaxation for the patient and is a very safe and effective
method (Kashani, 2011). According to the results of the present study, a significant percentage of cancer patients undergoing chemotherapy or radiotherapy were suffering from sleep disorders before the intervention. After ten sessions of the intervention, there was a significant difference in the mean scores of the components and the total score of quality of sleep index between the control and experimental groups. The results of this study indicate the effectiveness of active and receptive music therapy in the management of sleep disorders in cancer patients.

Considering that no prior research compared gender difference in the study of music therapy effectiveness, present study focused on comparison between male and female oncology patients. However, results of t-test, ANCOVA and post-Hoc revealed no significant difference based on gender regarding effectiveness of music therapy on sleep quality. Hence, as per the findings of the present study found no gender differences rejecting the hypothesis (H₃₄) and (H₄₁) that emphasized that males and females will show difference in the efficacy of active and receptive music therapy in improving of sleep quality.

Although it is commonly presumed that females are more empathic, relational, and psychologically minded than males and women take more advantages from music (Miles, Miranda & Ullman, 2016) but the result of this study have failed to confirm the assumption that women benefit more from music therapy than men. It can be due to relaxing influence of music, which is effective in both genders.

Affect

The data and analyses of t-test in present study show that there is a significant effect of music upon affect change and there is a significant reduction of negative affect after music therapy intervention. Hence the results support the hypotheses (H₄), (H₁₀) which anticipated that active music therapy and receptive music therapy as compared to control groups are effective in reduction of negative affect.

There is a lack of studies on role of music therapy in negative affect of patients. The study of Hilary and Fredenburg (2014) was congruent with present study. His randomized effectiveness study showed that a single receptive music therapy session can be an effective intervention concerning positive and negative affect for hospitalized BMT patients. Though the number of session in current study
was ten, and Hilary and Fredenburg (2014) study was only one session receptive music therapy, but the results of these two studies are in the same line.

While hospitalized, cancer patients who are receiving chemotherapy or radiotherapy do not often experience a high sense of control over their bodies or environments. Borne (1990) found that the feelings of personal effectiveness were important for successful health-related behavior and adjustment. Bohachick, Taylor, Sereika, Reeder, and Anton (2002) found that personal control was related to positive psychological outcomes and indicated that patients with a higher sense of personal control during their hospital stay reported higher levels of optimism, satisfaction with life, and wellbeing at six-month follow-up. Moreover, a patient’s tendency to adopt desirable or positive behaviors or adhere to recommended treatments has been found to be influenced by health locus of control beliefs, the perception that the causes of specific events will be attributed to personal, or internal control, or situational, or external control elements (Horden, 2017).

The theory behind the effectiveness of music therapy on negative affects is because music therapy distracted them from negative cancer related emotions. Interestingly, at the same time the perception of cancer related emotions during music therapy helped patients handling their disease. However, we only found significant evidence that relief was established by distraction, but not by the experience of negative emotions. Nevertheless patients might have psychological benefits and feel relieved by experiencing, expressing and sharing negative cancer related emotions and sorrows (Bertirotti, 2008).

The results support hypotheses (H₆), (H₁₂) and showed increase in post-test scores of positive affect after active music therapy and receptive music therapy intervention as compare to pre-test. Therefore, as seen in this case, individually music therapy seems to have positive outcomes on the cancer patient's negative affects, and their positive affects increased even more after the application of active and receptive music therapy.

There is compelling evidence that emotions may influence immune system function and thus susceptibility to and severity of immune-related diseases (Glaser &
Kiecolt-Glaser, 2005). This body of research has traditionally focused on negative affective states—such as depression, anxiety, and anger (Kiecolt-Glaser et al., 2002; Raison et al., 2006). However, there is growing interest in how positive psychological factors—such as positive affect, optimism, and benefit finding—affect health (Pressman and Cohen, 2005; Bower et al., 2008b) and the immunological pathways through which they exert their effects (Marsland et al., 2007).

Positive affect is the most commonly studied positive psychological factor relating to health and immune outcomes. There is not a lot of research to compare the results with. The results of our research also give information about the patients’ need to perceive particular emotions during music therapy. Most of our patients benefitted from music therapy by experiencing positive emotions, and their positive affect had increased.

Pothoulaki et al. (2012) indicated positive effects of music therapy interventions on a range of psychological and physiological responses including improved mood and enhanced overall wellbeing and positive attitudes toward life. In music therapy literatures which are in line with the results of present study, researchers consistently indicated positive outcomes when music therapists employed patient-preferred live music with hospitalized patients (Ferrer, 2007; Chaput-McGovern & Silverman, 2012; Cook & Silverman, 2013). Establishing a patient’s music preferences is an important part of every music therapy interaction due to the involved process and rapport building between the therapist and patient (Walworth, 2005).

A study by Boso, Politi, Barale & Enzo (2006) determined that dopamine is postulated to be involved in the enjoyment of music. It is demonstrated to be release from the ventral striatum and in the ventral segmental area in subjects listening to pleasant music. In addition, role of endorphins/endocannabinoids and nitrous oxide in emotional perception of music and in producing physical effects such as vasodilatation, local warming of the skin and a reduction in blood pressure as a response to listening music respectively are described (Menon & Levintin, 2005).

Additionally, previous researchers have found that patients who have not been
previously exposed to music therapy services were more likely to agree to participate in a music therapy session if the therapist did not require the patient to actively make music through singing or playing an instrument (Burns et al., 2005).

Bohachick et al. (2002) found patients who experienced a higher sense of personal control during hospitalization experienced higher levels of optimism and wellbeing at a six-month follow-up. Providing patient-preferred live music during a receptive music therapy session may not only distract the patient from negative affective states but may further provide a sense of support, autonomy, and control over a patient’s immediate environment.

The state of the disease is an alteration of the homeostatic balance of the psycho-neuro-immuno-endocrinic axis, due mainly to a primary etiological cause of the generalized stress and to negative mental phases, which produce biochemical, and electromagnetic unbalances and energetic blocks. As for a systemic outlook, that is the union between body and mind, this definition represents one of the fundamental paradigms in several theoretical models of music therapy (Boso et al., 2006).

A paired-samples t-test analysis found significant decrees of positive affect in post-test among control group. Chemotherapy and radiotherapy, being hospitalized and the environment of hospital can cause changes in cognitive functioning, which cause reduction of positive affect in cancer patients.

Hypothesis (H16) and (H22) expected that active and receptive music therapy to reduce negative affect of hospitalized patients in oncology unit as compare to no-therapy group. The results of study revealed that hypothesis was upheld in both active and receptive music therapy groups.

There is lack of study in effectiveness of music on positive and negative affect. In receptive music therapy it is reasonable to assume that listening to familiar songs and playing instruments facilitate nonverbal expression and communication. Our results are consistent with findings of few studies that done in effectiveness of music therapy on mood.

It was predicted in hypothesis (H18) and (H24) and supported in results that both types of music therapy are also effective to increase of positive affect in these patients. t-test and ANCOVA results clearly revealed the hypothesis was supported.
Halstead and Roscoe (2007) found that enhanced mood, increased expression of feeling, alongside contributing to feelings of enhanced quality of life were benefits gained through instrument playing; while Gauthier and Dallaire (1993) found that it helped facilitate communication between the client, their family and friends as well as staff members. Singing was shown to lead to a greater sense of self awareness and increased feelings of belonging (Clair, 1996), while also helping boost mood, confidence, assist with emotional release, and stimulate reminiscence and overall interactions with family (Aldrige, 1999). Toning and chanting were of specific benefit as they were linked with emotional and physical relief and reduced stress (Dileo, 1999). These studies support our findings.

In the current study this option offered to participants to choose preferred songs to listen in receptive music therapy and preferred song to play and sing in active music therapy. This decision made based on previous investigations with hospitalized medical patients indicating preference for receptive forms of music therapy such as patient-preferred live music (Chaput-McGovern & Silverman, 2012). Establishing a patient’s music preferences is an important part of every music therapy interaction due to the involved process and rapport building between the therapist and patient (Walworth, 2005). Additionally, previous researchers have found that patients who have not been previously exposed to music therapy services were more likely to agree to participate in a music therapy session if the therapist did not require the patient to actively make music through singing or instrument play (Burns et al., 2005). In current study through the active music therapy, the music therapist engaged each participant in his or her preferred music to promote active involvement and autonomy support as supported by Robb’s (2003) theoretical framework that music therapy interventions should be based from three elements of contextual support: structure or a planned session, autonomy support through music choice, and active involvement in the development of a client–therapist relationship.

The findings of present study are in line with investigation of Sakka and Juslin (2018) about emotion regulation with music in depressed and non-depressed individuals. The overall results of their study indicated that music was enhancing positive emotions.

It is also concluded in a study by Selle & Silverman (2017) that music therapy in the form of single-session patients preferred live music might be an effective
intervention for improving mood and pain in patients on a cardiovascular unit. Although there is a difference in number of sessions and music therapy method, but the result of this study is congruent with present study that shows active and receptive music therapy increase positive affect of cancer patients.

Another randomize control study which was in line with current study found that music therapy improves the mood of patients undergoing hematopoietic stem cells transplantation (Dóro, Neto, Cunha & Dóro, 2017).

The findings of Hayashi et al. (2002) also showed significant effects of music therapy on emotional withdrawal, poor rapport, and passive-apathetic syndromes. It can be assumed that music reconnects these participants with their environment due to an innate, primitive affinity that all human beings possess towards music, which transcends verbal communication (Tyson, 1984).

Analyses of covariance (ANCOVA) and post-Hoc indicate that the effect of music therapy is relatively stronger in active music therapy. That is supporting hypothesis (H_{28}) and (H_{30}) which stated that active music therapy, as compare to receptive music therapy is more effective in reduction of negative affect and increase of positive affect.

There is a lack of research, which compares active and receptive music therapy. Researchers have found positive effects concerning live music when compared to recorded music in medical music therapy settings as described by Standly (1986). Studies by Cain (1991); Winter, Paskin & Baker (1994), described that clinicians have successfully used patient-preferred live music to reduce fatigue, anxiety, increase coping skills, and shorten length of stay for pediatric and adult patients. The use of live music allows the music therapist to observe fluctuations between calm and anxious behaviors and enables the therapist to reflect those changes through the music by manipulating musical elements such as tempo, volume, and intensity, or utilizing the iso-principle. The iso-principle, originally coined “iso-moodic” consists of matching music qualities (i.e., tempo, volume, or intensity) to the patient's current level of anxiety or behavioral state, allowing gradual change in music to facilitate the desired change in patient behavior or mood (Heiderscheit & Madson, 2015).
Next to the assessment of positive and negative affect, it would be advisable to assess musical expression of emotions in future studies. Emotional expressivity of patients’ musical play could be observed with the help of developed measurement instruments. For example, Wosch (2001) has developed a computerized tool, which aims to measure emotional expressivity and its changes within music therapy improvisations. While listening to the taped improvisation he clicks at those emotions he hears within the improvisation. The rater can choose between five different basic emotions, such as anger and joy. The tool enables the rater to appoint the exact moment of expressed emotions as well as emotional changes within the improvisation. Comparing improvisations of different sessions might give valuable information about the process and possible progress of the patient’s musical expressivity of emotions. The tool was developed for individual music therapy; an analysis of the improvisations might be difficult within a group setting.

As it was expected in hypotheses (H_{35}) and (H_{36}) the gender difference emerged in present study and the results supported hypotheses (H_{40}) and (H_{42}) that claimed males and females will show difference in the efficacy of active and receptive music therapy in reduction of negative affect and increase of positive affect. The analysis of t-test showed among the gender, females in comparison to males counterparts showed slightly better positive effect on almost all the groups, with active music therapy showing the maximum difference.

One explanation for the stronger effect of music on female participants may be got in terms of cultural expectations in Iranian society that response to emotionally touched musical stimuli maybe pierces deeper into the female psyche as compared to the male participants. According to this idea, women could take advantage from music in an emotional way, as they spend more time at home due to their traditional roles in our country and spend more time listening to music. Music can be one of the most soothing experiences that are always available for them, and listening to music may alleviate stress and ward off tensions when they are working at home.
Conclusion

Based on the findings of the present study, it is clear that continued sessions of music-therapy are effective in significantly reducing anxiety, pain, fatigue and improving sleep quality and affect in cancer patients, when used along with standard palliative care in cancer patients undergoing chemotherapy and radiotherapy treatment. Music-therapy can, therefore, be considered as a non-pharmacological method of reducing cancer related psychological distresses and problems. Active music-therapy involving playing guitar and singing was significantly more effective than receptive music-therapy which involved listening to pop Persian music by Mp3 player. In receptive music therapy the protocol of patient-preferred music is useful method to increase the level of satisfaction and efficiency of music therapy.

The results emphatically imply that females after music therapy sessions revealed lower scores of anxiety and pain. As it is clear from the results that music therapy techniques (both active and receptive) can be useful tools for modulating the emotional state of end-of-life patients. Helping such patients to modulate their emotions may improve their quality of life by helping them to cope with the emotional effects inherent in their condition.