

THE EFFECT OF MUSIC-ASSISTED PROGRESSIVE MUSCLE RELAXATION ON
THE SELF-REPORTED SYMPTOMS OF WOMEN WITH PRIMARY
DYSMENORRHOEA

BY

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ABSTRACT

The purpose of this study was to examine the effect of music-assisted progressive muscle relaxation (PMR) on the self-reported symptom scores of women suffering from primary dysmenorrhoea. Twenty-four women with a mean age of 22.7 years participated in the study and were evenly divided in three groups: a control group (n=8), a PMR only group (n=8), and a PMR with music group (n=8). After completing the modified Shortened Premenstrual Assessment Form (SPAF), which was used both as both a determinate of eligibility in the study and as a pretest, participants completed the SPAF for the first three days of their menstrual cycle. Participants in the PMR-only group completed a PMR exercise in their home for the first three days of their period prior to completing the modified SPAF. Participants in the PMR with music group completed a music-assisted PMR exercise in their home for the first three days of their period prior to completing the modified SPAF. Results of the study indicated no significant reduction of symptoms among the PMR with music group in comparison with the other conditions. Further research is warranted, with a suggested larger and more diverse sample, as well as a more structured environment for the completion of the PMR exercises.

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CHAPTER ONE

Introduction

Many women likely experience some discomfort during their period, whether it be a headache, menstrual cramps, or bloating. The majority of women accept this discomfort and potential pain associated with their period as an inevitability of life, take ibuprofen to deal with the cramps and headache, and go on with their daily routine. However, for many women, their monthly menstrual cycle is much more than simply an annoyance. Upwards of 60% of women may have primary dysmenorrhoea (Burnett et al, 2005; Coco, 1999), which is defined as painful periods that cannot be explained from having another diagnosis, such as endometriosis (Weissman, Hartz, Hansen, & Johnson, 2004). For women with primary dysmenorrhoea, the pain and discomfort associated with menstruation can be debilitating, and can result in absenteeism from work and school and cause an overall disruption in these women's daily life on a monthly basis (Andersch & Milsom, 1982; Sundell, Milson & Andersch, 1990).

In the research community, there is a general consensus that there is a reciprocal relationship between stress and pain (Hadjistavropoulos & LaChapelle, 2005). There is further evidence suggesting that stress can have deleterious physiological effects based on the release of certain stress-triggered hormones (Amir, Brown, & Amit, 1979; Polk, Cohen, Doyle, Skoner, & Kirschbaum, 2005). These hormones can inhibit the body to manage pain. Therefore, when treating pain, such as with the symptoms associated with primary dysmenorrhoea, it is necessary to also treat and attempt to reduce stress.

Most women with primary dysmenorrhoea self-treat their symptoms with over-the-counter pain relievers or other methods, such as heating pads (French, 2008).

However, several women choose to treat their dysmenorrhoea with more alternative approaches, as with acupuncture and various relaxation techniques, for example (Helms, 1987; Proctor, Murphy, Pattison, Suckling, & Farquahr, 2007). There is research indicating that relaxation techniques, especially progressive muscle relaxation, are successful interventions in reducing the pain associated with the symptoms of primary dysmenorrhoea (Ben-Menachem, 1980; Harel, 2006; McCallie, Blum, & Hood, 2006; Proctor, Murphy, Pattison, Suckling, & Farquahr, 2007).

Progressive muscle relaxation (PMR) is an accessible and simple technique that can be performed in a home setting (Jacobson, 1938, 1987; Lolak, Connors, Sheridan, & Wise, 2008). Although PMR can be performed in silence, research indicates that progressive muscle relaxation is especially effective when paired with music (Davis, 1992; Robb et al, 1995; Strauser, 1997). An abundance of research has examined the relationship between music and relaxation, and on a broader level, the relationship between music and stress and music and pain (Brodsky & Sloboda, 1997; Kemper, Hamilton, McLean, & Lovato, 2008; Kenny & Faunce, 2004; Kim & Koh, 2005; McCraty, Atkinson, Rein, & Watkins, 1999; Whitehead-Pleaux & Baryza, 2006). In various capacities, research indicates that music is an effective tool in distracting individuals from pain (Robinson, 1998) and has been effective in reducing self-reported pain in numerous populations ranging from pediatric patients receiving dressing changes (Whitehead-Pleaux & Baryza, 2006) to hospice patients receiving end-of-life care (Groen, 2007). Certain sedative properties of music (i. e. timbre, tempo, and volume) are effective in reducing heart rate and respiration rate (Iwanaga, Kobayashi, & Kawasaki, 2004; Lai & Good, 2005), which in turn can be effective in reducing perceived levels of

stress and pain. The combination of sedative music and relaxation techniques have been especially effective in studies relating to pain and stress reduction (Chafin, Roy, Gerin, & Christenfeld, 2004; Evans, 2002; Iwanaga, Kobayashi, & Kawasaki, 2004; Knight & Rickard, 2001; Lai & Good, 2005).

There is very little research specifically addressing the relationship between the use of music and painful periods, much less any research examining the relationship between music, dysmenorrhoea and PMR. Due to the prevalence of dysmenorrhoea and because of the accessibility and evident effectiveness of PMR and sedative music, this study aims to examine the effectiveness of music-assisted PMR on the self-reported symptoms of women with dysmenorrhoea. With the underlying assumption that a relaxation exercise such as PMR can reduce the symptoms of stress and subsequently reduce perceived pain, this study aims to examine if sedative music is more effective in reducing stress and pain levels than the PMR exercise alone. Furthermore, this study hopes to create an accessible protocol that could be used by women with dysmenorrhoea on a larger scale.

Research question:

- 1) Is there a significant difference among three treatment conditions (control, PMR only, and PMR with music) on women's self-reported symptoms during the first three days of their menstrual cycle?

CHAPTER TWO

Review of Literature

Definition, etiology, epidemiology, and treatment of primary dysmenorrhoea

Period pain, or dysmenorrhoea, is common among most pre-menopausal women. Among women in their reproductive years, dysmenorrhoea is the most common gynecologic disorder (Coco, 1999; Sharma, Taneja, Sharma, & Saha, 2008). There are two types of dysmenorrhoea, primary and secondary. Primary dysmenorrhoea is defined as painful menstruation resulting from a functional disturbance in pre-menopausal women (Weissman, Hartz, Hansen, & Johnson, 2004). To receive a diagnosis of primary dysmenorrhoea, the pain experienced during menstruation cannot be the result of organic factors, such as growths, an underlying disease such as endometriosis, or another disorder. Although the exact cause of primary dysmenorrhoea is not exactly understood, most physicians attribute primary dysmenorrhoea to heightened levels of endometrial prostaglandin, which results in increased uterine tone and frequent and subsequently painful uterine contractions (Coco, 1999; French, 2008). Additional research has indicated other risk factors associated with the development of primary dysmenorrhoea, such as early menarche, smoking, obesity, alcohol consumption and long menstrual periods (Latthe, Mignini, Gray, Hills, & Khan, 2006).

Women with primary dysmenorrhoea experience a variety of symptoms, including stabbing, dull or throbbing pain in the abdomen, lower back and/or thighs (Dawood, 2006). Women with this diagnosis may also experience nausea, vomiting, diarrhea, fatigue, changes in mood, fever and headaches (Andersch & Milsom, 1982; French, 2005). The symptoms associated with primary dysmenorrhoea typically begin a

few hours before menstruation begins and may peak during the heaviest flow during menstruation, typically within the first day or two of the cycle (Castelo-Branco, Casals, Haya, Cancelo, & Manasanch, 2004; Dawood, 1990, 2006; French, 2008).

Various studies have estimated the prevalence of primary dysmenorrhoea ranging from 60-93% (Burnett et al, 2005; Coco, 1999; Jameison & Steege, 1996; Hillen, Grbavac, Johnston, Straton, & Keogh, 1999; Wilson & Keye, 1989). Other research approximates the number of women with primary dysmenorrhoea as 2.5 million (Clayton, 2008), although this number is difficult to estimate. Primary dysmenorrhoea is potentially so commonplace that many women do not report it in medical interviews because they feel that there is nothing that can be done to treat it, despite restriction of their daily activities (Coco, 1999). There has been some evidence that symptoms of primary dysmenorrhoea decrease with age (Sundell, Milson, & Andersch, 1990), however, other studies have not supported this evidence (Dawood, 1990; Smith, 1993).

Resulting from the pain and discomfort associated with primary dysmenorrhoea, primary dysmenorrhoea is associated with high levels of absenteeism from school and work and an overall loss of quality of life. Among adolescent girls, dysmenorrhoea is the leading cause of recurrent short-term absenteeism from school (Chen, Lin, Heitkemper, & Wu, 2006). In a study of college-aged women, 42% of subjects reported absenteeism or loss of activity on at least one occasion (Harlow & Park, 1996). Long-range studies of women with primary dysmenorrhoea estimate absenteeism levels from school or work at 34-50% (Andersch & Milsom, 1982; Sundell, Milson & Andersch, 1990). One study estimated work absenteeism resulting from primary dysmenorrhoea accounted for 600 million hours of lost work and \$2 billion in annual lost productivity (Dawood, 1984).

The majority of women with dysmenorrhoea self-treat their symptoms with Nonsteroidal anti-inflammatory drugs (NSAIDs), such as Ibuprofen (French, 2008; Proctor & Farquahr, 2002). If NSAIDs are not successful for pain management, some women manage their symptoms with oral contraceptives, or with other hormonal therapies, such as Depo-Provera and Lupron (Proctor & Farquahr, 2002). Women who do not want to treat their dysmenorrhoea with pharmacological means may manage their symptoms through the application of heat to any painful area (Proctor & Farquahr, 2002); acupuncture (Helms, 1987); omega-3 fatty acid supplements (Harel, Biro, Kottenhahn & Rosenthal, 1996); spinal manipulation (Proctor, Hing, Johnson, & Murphy 2004); exercise (Proctor & Farquahr, 2002); and relaxation techniques (Proctor, Murphy, Pattison, Suckling, & Farquahr, 2007).

Stress and dysmenorrhoea

Several existing studies emphasize the negative and potentially deleterious relationship between stress and dysmenorrhoea (Laszlo, Gyorffy, Adam, Csoboth, & Kopp, 2008; Metheny & Smith, 1989; Proctor, Roberts, & Farquhar, 2001). A recent study examined stress levels and dysmenorrhoea among 388 healthy menstruating women in China. Their individual stress perception and dysmenorrhoea symptoms were recorded in daily diaries. Results from this study indicated that the risk of dysmenorrhoea was more than twice as great among women with higher levels of stress than women with lower stress levels (Wang et al, 2006). In a similar study, 2772 working women in Sweden were surveyed regarding their menstrual pain in relation to work-related factors, such as job control, co-worker social support, job security and dissatisfaction with the

job. Results indicated a significant relationship between work-related stress factors and more severe menstrual pain (Laszlo, Gyorffy, Adam, Csoboth, & Kopp, 2008).

Stress can cause alterations in menstruation and alterations in menstruation can cause stress, therefore making the relationship between stress and menstruation reciprocal (Dalton, 1984). Loucks and Redman (2004) state that any disruption in menstruation resulting from stress stems from an activation of the hypothalamic-pituitary-adrenal (HPA) axis, in which this activation ultimately causes an energy deficiency in the body. This energy deficiency, in turn, results in more painful periods. Therefore, reducing stress can potentially help in the management of dysmenorrhoea (Metheny & Smith, 1989).

The relationship between stress and pain

Many individuals find the concept of pain to be stressful, in turn, creating a reciprocal relationship between stress and pain. This increased stress, in turn, can make pain more severe (Hadjistavropoulos & LaChapelle, 2005). Weisenberg (1994) states that pain perception is highly influenced by an individual's anxiety and stress level. The relationship between stress and pain is strong and has been documented in the literature. Results of a study of young adults with chronic lower back pain in Great Britain (n = 571) indicated that psychological stress was highly correlated with the onset of back pain (Power, Frank, Hertzman, Shierhout, & Li, 2001). A 2004 study of African American adults with Sickle-Cell disease (n = 41) examined the relationship between daily mood, stress and pain. Over the course of 91 days, each participant kept a diary in which they rated their stress and mood and same-day pain levels. Results indicated that increases in stress were associated with increases in same-day pain (Gil et al, 2004).

Several studies have documented the potentially deleterious physiological effects that stress can have on the body. Research has indicated that the stress hormone adrenocorticotrophic hormone (ACTH) can impede production of the body's natural pain relievers, known as endorphins. An increase in ACTH has been correlated with a heightened sense of pain and discomfort (Amir, Brown, & Amit, 1979). In a study of individuals with rheumatoid arthritis, researchers discovered that levels of prolactin, a hormone released by the pituitary gland in response to stress, were twice as high among those individuals that reported high levels of interpersonal stress than among those not stressed (Erb, Pace, Delamere, & Kitas, 2001). Furthermore, in a similar study, individuals who reported high stress levels maintained higher levels of corticotrophin-releasing factor (CRF), which interferes with the immune system. These individuals were more likely to contract a cold than those not under stress (Polk, Cohen, Doyle, Skoner, & Kirschbaum, 2005). Therefore, simply stated, addressing stress and attempting to reduce stress can potentially reduce pain levels across a variety of conditions and diagnoses.

Progressive muscle relaxation and pain and stress management

As stress has been linked to more severe pain-related symptoms of dysmenhorrea, stress management techniques, including relaxation techniques, may help to reduce pain and discomfort during the menstrual cycle. Progressive muscle relaxation (PMR), a relaxation technique developed by Edmund Jacobson (1938, 1987), has been shown to be especially effective in pain and stress management (Carroll & Seers, 2001; Sloman, 1995). PMR is a simple technique in which the individual relaxes their muscles in a two-step process. First, tension is deliberately applied to certain muscle groups. Secondly, the

tension is stopped and attention is given to how the muscles relax as the tension moves away (Carlson & Hoyle, 1993).

Many individuals prefer to use PMR because of the flexibility and simplicity of the exercise: PMR can be implemented in a home or work environment and takes only a few minutes. PMR can be taught and implemented individually, or the exercise can be performed using a pre-recorded tape narrating the exercise (Lolak, Connors, Sheridan, & Wise, 2008). It should be cautioned that PMR should only be used with the approval of a physician, as in some instances, PMR can be ineffective and even counterproductive (Harris, 2003).

The effectiveness of PMR in relation to pain and stress has been well-documented among several populations. Results from research studies utilizing PMR as a therapeutic intervention have indicated a reduction in certain symptoms, including a reduction of shortness of breath among young adults with asthma (Nickel et al, 2005); a reduction of pain and distress during labor (Bagharpoosh, Sangestani, & Goodarzi, 2006); a reduction of pain and nausea associated with cancer (Kwekkeboom, Wanta, & Bumpus, 2008); a reduction of arthritis pain and an increase in gross and fine motor function (Kwekkeboom & Gretarsdottir, 2006); and a reduction of stress levels of individuals who have recently had a heart attack (Lolak, Connors, Sheridan, & Wise, 2008). The efficacy of PMR has also been illustrated among individuals with Alzheimer's disease, where Suhr, Anderson and Tranel (1999) found that clients with Alzheimer's who learned PMR showed significant decreases in psychotic and behavioural disturbances that are common to the disease.

Progressive muscle relaxation and dysmenorrhoea

As PMR has been a successful medium to reduce symptoms associated with pain and stress, research indicates that PMR can also potentially be a helpful tool among women with primary dysmenorrhoea. Results from studies examining the utilization of relaxation techniques to manage the symptoms associated with dysmenorrhoea and painful menstruation have indicated that some women benefit from employing relaxation techniques during menstruation (Ben-Menachem, 1980; Dietvorst & Osbourne, 1978; Harel, 2006; McCallie, Blum, & Hood, 2006; Tzafettas, 2006). A review of five trials and 213 women found that PMR with or without imagery was the most successful intervention for treating the spasmodic symptoms of dysmenorrhoea (Proctor, Murphy, Pattison, Suckling, & Farquhar, 2007). Furthermore, in a review of 15 studies of the effectiveness of relaxation interventions, the most frequently supported technique was PMR, especially in regard to pre-menstrual syndrome and dysmenorrhoea (Kwekkeboom & Gretarsdottir, 2006).

Additional studies support the effectiveness of PMR on the symptoms associated with dysmenorrhoea. A study of 10 high school girls who were given relaxation training and therapy found that these girls had significantly less cramping, nausea, concentration problems and irritability than those girls who did not receive relaxation training (Ben-Menachem, 1980). A study of women who received four sessions of relaxation training had significant reductions in their pain levels related to dysmenorrhoea compared to a control group, as well as their own baselines. 18 months after the completion of the study, the benefits of the relaxation training were still evident, as the women continued to report lower pain scores (Quillen & Denney, 1982).

Music and pain

The theoretical use of music as a means to potentially treat pain is rooted in Melzack and Wall's gate control theory of pain (1965). The gate control theory states that perceived physical pain is manipulated by the interaction of various neurons, which are both pain-transmitting and non-pain-transmitting. Furthermore, this theory asserts that activating non-pain-transmitting nerves can intercept signals from pain fibers and therefore reduce and inhibit an individual's perceived pain. Based on this theory, a neural stimulus with a positive affective quality, such as music, can potentially distract an individual from pain and therefore decrease perceived pain and support relaxation (Robinson, 1998). Stimuli that are emotionally engaging are especially powerful and effective (Leventhal, 1992). Therefore, active music listening may provide an "emotionally engaging distraction capable of reducing both the sensation of pain itself and the accompanying negative affective experience" (Mitchell, MacDonald, Knussen, & Serpell, 2007, p. 37).

The effectiveness of the music used when addressing pain has much to do with the properties of the music. Sedative music is characterized by a slow tempo (approximately 60 to 80 beats per minute without accented beats), low amplitude, and a melodic and instrumental timbre (Iakovides et al, 2004; Voss et al, 2004). Exposure to sedative music has been linked to reduced heart rate (Iwanaga, Kobayashi, & Kawasaki, 2004; Lai & Good, 2005), reduced respiratory rate (Evans, 2002) and lower blood pressure (Chafin, Roy, Gerin, & Christenfeld, 2004; Knight & Rickard, 2001), all of which are linked to increased levels of perceived pain. Research has supported the idea of sedative music as an effective tool for managing pain among individuals recovering from

open heart surgery (Voss et al, 2004); women experiencing labor pain (Phamdoung, 2003); post-operative individuals who received intestinal surgery (Good, Anderson, Ahn, Cong, & Stanton-Hicks, 2005); and individuals undergoing gastrointestinal procedures (Bampton & Draper, 1997).

Results from several studies have indicated that music can be utilized as a successful treatment modality for pain across various populations, including: stroke patients (Kim & Koh, 2005); pediatric patients receiving dressing changes (Whitehead-Pleaux & Baryza, 2006); patients receiving cardiac surgery (Sendelbach, Halm, Doran, Miller, & Galliard, 2006); hospice patients receiving end-of-life care (Groen, 2007); and individuals with chronic pain (Kenny & Faunce, 2004). The effectiveness of music as a treatment modality is dependent upon several factors, including, aforementioned, the type of music utilized, as well as the individual receiving treatment. Because pain is subjective, complex and is manifested differently from individual to individual (O'Callaghan, 2001; Presner, Yowler, Smith, Steele, & Frantianne, 2001), individual music preference may impact an individual's perceived pain (Mitchell, & MacDonald, 2006).

Music and stress

As music has been used extensively to treat various manifestations of pain across populations, music has also been employed to address the many symptoms and side effects that stress can have on an individual. Stress can lead to deleterious effects on the body, including reduced immune functions. For individuals suffering from any type of pain, prolonged stress can intensify the pain (Hadjistavropoulos & LaChapelle, 2005). Research indicates that music is an effective tool in reducing the physiological symptoms

of stress: a study examining the effect of music on emotional states found that individuals who listened to certain types of music in conjunction with a self-induced positive emotional state produced higher levels of salivary IgA and autonomic activity, both of which are related to the immune system (McCarty, Atkinson, Rein, & Watkins, 1999). In other words, music can potentially directly impact and influence the physiological functions that are affected by stress. As music can act as a distractor from the physiological symptoms associated with pain, music can provide cues for relaxation and focus an individual's attention away from stress-related thinking and provide distraction (Scarletti, 1989). Aforementioned, Knight and Rickard (2001) found that exposure to music reduced systolic blood pressure and heart rate. In this same study, the subjective stress levels of individuals were also reduced. Because stress and anxiety can affect an individual not only physically, but also emotionally, music is a successful modality in treating stress because it can evoke responses that are physiological, psychological and emotional (Brodsky & Sloboda, 1997).

Numerous research studies have shown that music can reduce anxiety and physiological stress levels across various populations, including: individuals receiving chiropractic interventions (Strauser, 1997); musicians experiencing performance anxiety (Kim, 2008); pediatric oncology patients (Kemper, Hamilton, McLean, & Lovato, 2008); college students (Labbe, Schmidt, Babin, & Pharr, 2007); individuals receiving chemotherapy treatments (Ferrer, 2007); and females in a substance abuse treatment center (Cevasco, Kennedy, & Generally, 2005). There is some discrepancy in the type of music that is most successful in reducing stress. Although research indicates that sedative music is successful in reducing stress levels, if an individual has a negative association

with so-called slow music, "that person would not be able to relax with this music, and might even become more tense than he or she would have without music" (Stratton & Zalanowski, 1984, p. 190). Elliot (1994) found that individuals in a coronary care center who were not allowed to choose their music by which to relax and listened to light classical music displayed no significant reductions in anxiety. However, because as pain is a personal experience, perceived stress is also manifested differently from individual to individual; therefore, each individual will respond in various manners to various types of music given their age, musical preference, previous music experience and type of stress (Pelletier, 2004).

Progressive muscle relaxation, music and dysmenorrhoea

Although music is a successful modality when used alone, research has indicated that music paired with PMR is an especially effective tool in reducing stress, pain, or both (Davis, 1992; Robb et al, 1995; Strauser, 1997). Relaxation and music are often synonymous: Thaut and Davis (1993) suggest that many individuals automatically combine physical relaxation techniques and music. In clinical settings, music and relaxation are often utilized as a therapeutic intervention and presented in a systematic and sequential fashion (Maranto, 1993; Wolf, 1996).

A study of 60 university students examined the efficacy of various relaxation techniques by randomly assigning participants to one of the following conditions: music assisted PMR, PMR alone, music listening, or silence. Although there was no significant difference among the groups in ANCOVA analysis for the State Trait Anxiety Inventory (STAI) or Visual Analog Scale, the music assisted PMR condition yielded the greatest amount of change among the conditions in regard to the mean scores (Robb, 2000). An

earlier study examined the effect of PMR and music on stress as measured by finger temperature response, or vasoconstriction. Significant increases in finger temperatures were found across all conditions of music, progressive muscle relaxation and the combination of both, although there were no significant differences between the groups. In comparing pre- and post-test scores, the PMR combined with music resulted in the greatest mean difference (Kibler & Rider, 1983). An analogous study combined a combination of biofeedback, autogenic training phrases and music, Reynolds (1984) found that music alone and in combination with the various relaxation techniques produced the greatest difference in arousal level when measured by electromyography.

There is little research specifically addressing the relationship between music and the treatment of dysmenorrhoea. However, a handful of studies examine similar relationships. For example, Phamdoung's (2003) study examined the effect of music on labor pain. Results of the study indicated that women (N=55) who were exposed to music without lyrics for three hours starting early in the active phase of labor displayed significant relief of severe pain across three hours of labor and delayed the increase of affective pain for one hour. Colwell's study (1997) examined a female who had chronic gynecological pain post operatively resulting from endometriosis scar tissue. After 14 sessions that combined music, singing, creative imagery, and PMR, the woman's self-reported pain and feelings of control over her pain moved from 48% to 37% post-session.

Purpose

The purpose of this study is to examine the effect of music-assisted PMR on the self-reported pain levels of women with primary dysmenorrhoea during the first three

days of their menstrual cycle. This study also aims to determine if music-assisted PMR is more effective in reducing self-reported pain scores than PMR without music.

CHAPTER THREE

Method

Participants

Participants (N=24) in this study were pre-menopausal, menstruating women ages 18-29. Participants either received a diagnosis of primary dysmenorrhoea by a doctor or had self-reported symptoms of dysmenorrhoea (i.e. menstrual cramps, headaches, and back pain) in the past three months. The period pain of participants was not the result of organic factors, such as growths, an underlying disease such as endometriosis, or another disorder. Participants were additionally screened by completing a modified version of the Shortened Premenstrual Assessment Form (SPAF) (Allen, McBride, & Pirie, 1991) during the initial visit with the researcher. Individuals who scored a 30 or more (out of a possible 60) on the SPAF continued in the study.

Materials

All participants (N=24) received and completed the modified SPAF. The SPAF is a 10-question questionnaire that uses a Likert scale of 1 to 6, with 1 indicating no change from usual to 6, indicating extreme change from usual. The questions in the modified SPAF were modified by the researcher to be inclusive of the most common symptoms of menstruation, including: headaches; feelings of stress and feelings of being overwhelmed; feeling sad and blue; backaches; irritability; tenderness of breasts; nausea, vomiting or diarrhea; discomfort or pain in abdomen; fatigue; and feelings of being bloated. All participants also received and completed a modified daily symptom calendar. The modified daily symptom calendar contained the same questions as the modified SPAF, but the format was presented in a calendar-type setting for the participant to complete

once daily over the course of several days. A small group of participants (N=8) received a pre-recorded guided PMR exercise (read and recorded by the author) with no music accompaniment (PMR only). A second small group of participants (N=8) received a pre-recorded guided PMR exercise (read and recorded by the author) with music accompaniment (PMR with music). The guided PMR exercise script was taken from Sebenick (2001). The music that was used as accompaniment with pre-recorded guided PMR was *Healing garden music: Relaxation* (Various Artists, 2001).

Design

This study consisted of three groups for a total N of 24: a control group (n=8) that was no-relaxation exercise and no-music; a PMR only group (n=8); and a PMR with music group (n=8).

Procedure

Participants were randomly assigned to either the control group, the PMR-only group, or the PMR and music group. Individuals assigned to the control group met with the author and completed a copy of the modified SPAF questionnaire as a screening measure. Individuals who scored 30 or above continued in the study. Their completed modified SPAF questionnaire was used as a pre-test measure. The control group also received one copy of the daily symptom calendar. The control group was instructed to fill out the questionnaire for the first three days of their next menstrual cycle. Participants in the control group were asked to return their daily symptom calendars to the researcher either in person or by mail.

Individuals assigned to the PMR-only group met with the researcher and completed a copy of the modified SPAF questionnaire as a screening measure.

Individuals who scored 30 or above continued in the study. Their completed modified SPAF questionnaire was also used as a pre-test measure. They additionally received a daily symptom calendar, in addition to a pre-recorded CD with a guided PMR exercise read by the researcher. Participants in the PMR-only group were instructed to find a quiet and comfortable place in their home to complete the PMR exercise. The researcher suggested these participants wear comfortable clothing and complete the exercise in a comfortable chair, or lying on the floor on a yoga mat or blanket. The researcher also engaged the participant in a brief run-through of the PMR exercise. These participants were instructed to complete the PMR exercise with the CD as a guide once a day for the first three days of their next period. Immediately after the PMR exercise was completed, participants were asked to fill out the daily symptom calendars for the first three days of their next period. The participants were asked to return the daily symptom calendar to the researcher in person or by mail.

Individuals assigned to the PMR and music group met with the researcher and were asked to complete a copy of the modified SPAF questionnaire as a pre-test measure. Individuals who scored 30 or above continued in the study. Their completed modified SPAF questionnaire was also used as a pre-test measure. They also received a daily symptom questionnaire, in addition to a pre-recorded CD with a guided PMR exercise read by the researcher with music-accompaniment in the background. Participants in the PMR and music group were instructed to find a quiet and comfortable place in their home to complete the PMR exercise. The researcher suggested these participants wear comfortable clothing and complete the exercise in a comfortable chair, or lying on the floor on a yoga mat or blanket in a room where the lights have been dimmed. In this first

meeting, the researcher also engaged the participant in a brief run-through of the PMR exercise. These participants were instructed to complete the PMR exercise with the CD as a guide once a day for the first three days of their period. Immediately after the PMR exercise was completed, participants were instructed to complete the daily symptom calendar for the first three days of their period. The participants were then asked to return the daily symptom questionnaires to the researcher in person or by mail.

Data Analysis

To analyze the data collected from the modified SPAF, MANOVA analysis was utilized to examine the total pre-test scores and total scores for Days 1-3 across each condition. MANOVA was also used to compare the means of the 10 symptoms presented on the modified SPAF for the pre-test and Days 1-3 in the study for each condition.

CHAPTER FOUR

Results

Demographic results

All participants in this study were female who scored a 30 or above on the SPAF. All participants were between ages 18-29, with a mean age of 22.7 years (n=24). The mean age for the control group was 25.1 years of age, the mean age for the PMR-only group was 21.1, and the mean age for the PMR-music group was 21.8.

Total mean scores

Using a MANOVA analysis of the total modified SPAF scores for the pretest and Days 1-3 across each condition and time, there was no significant difference in scores. Using Pillai's Trace, the F-value was .833 (df=8) with a p-value of .579 ($p < .05$). Although there was no significance across each condition, it is important to note that when looking at the total mean scores across each condition, there was the greatest change in means between the pretest of the PMR-music group and the Day 1 score of the same group when compared with the control and PMR-only group.

Table 1

Total mean scores across conditions

	Pretest	Day 1	Day 2	Day 3
Control	35.3	30.7	26.7	22.0
PMR only	35.0	30.2	26.5	23.8
PMR music	36.2	28.1	25.1	20.8

Headache symptom scores across days and conditions

Looking at the headache symptoms of all study participants as reported in the pretest and during Days 1-3 of their period, a MANOVA analysis indicates that there was no significant difference in scores across each condition and time. Pillai's Trace indicates an F-value of Using Pillai's Trace, the F-value was .304 (df=8) with a p-value of .960 ($p < .05$). Although there is a decline in headache scores across all groups during each day, interestingly, there was an increase in the average headache mean score of the PMR-music group between Day 2 and Day 3.

Table 2

Mean scores of headache symptoms across conditions

	Pretest	Day 1	Day 2	Day 3
Control	3.13	2.00	1.88	1.75
PMR only	3.38	2.13	1.88	1.88
PMR music	2.75	2.13	2.13	4.00

Stress symptoms across days and conditions

A MANOVA analysis indicates that there was no significant difference in stress symptom scores for participants in each condition or time across the pretest and Days 1-3 of the study. Using Pillai's Trace, the F-value was .291 (df=8) with a p-value of .965 ($p < .05$). Again, there is a general decline in scores across all conditions over the course of the study, but no significant changes.

Table 3

Mean scores of stress symptoms across conditions

	Pretest	Day 1	Day 2	Day 3
Control	3.50	2.88	2.88	2.25
PMR only	3.87	2.63	2.38	2.50
PMR music	3.58	2.75	2.67	2.25

Sadness symptoms across days and conditions

The MANOVA analysis of the sadness symptoms of participants across conditions and time also indicates no significant change. Pillai's Trace reflects an F-value was .640 (df=8) with a p-value of .740 ($p < .05$).

Table 4

Mean scores of sadness symptoms across conditions

	Pretest	Day 1	Day 2	Day 3
Control	3.63	3.00	2.75	2.50
PMR only	4.25	2.75	2.38	2.50
PMR music	3.13	2.79	2.46	2.38

Back pain symptoms across days and conditions

There were no significant differences in back pain symptoms among participants across conditions and time during the course of the study. Using a MANOVA analysis of the back pain scores, Pillai's trace indicates the F-value was .871 (df=8) with a p-value of .549 ($p < .05$).

Table 5

Mean scores of back pain across conditions

	Pretest	Day 1	Day 2	Day 3
Control	2.63	2.63	2.38	1.88
PMR only	3.50	2.38	2.25	1.88
PMR music	3.75	3.13	2.63	2.50

Feelings of irritability across days and conditions

An examination of the symptoms related to feelings of irritability of the study participants as self-reported in the pretest and during Days 1-3 of their period, a MANOVA analysis indicates that there was no significant difference in scores across each condition or time. Pillai's Trace indicates an F-value of .525 (df=8) with a p-value of .830 ($p < .05$).

Table 6

Mean scores of feelings of irritability across conditions

	Pretest	Day 1	Day 2	Day 3
Control	3.88	3.38	3.25	2.50
PMR only	4.50	3.25	2.88	2.38
PMR music	3.63	2.75	2.38	2.00

Breast tenderness scores across days and conditions

For the breast tenderness scores of the participants in the study, there was no significant changes in score across each condition and over time. A MANOVA analysis,

using Pillai's trace, indicated an F score of .633 (df=8) and a p-value of .745 ($p < .05$).

Although no significance was indicated in these results, it is worth noting that the breast tenderness scores of the PMR-music group declined nearly two points between the pretest and Day 1 scores.

Table 7

Mean scores of breast tenderness scores across conditions

	Pretest	Day 1	Day 2	Day 3
Control	3.63	2.75	2.38	2.38
PMR only	3.37	2.38	2.13	1.75
PMR music	3.13	1.87	1.50	1.38

Nausea and vomiting scores across days and conditions

A MANOVA analysis of the nausea and vomiting scores of the participants in each condition or time for the pretest and Days 1-3 of their period indicated no significant change. Using Pillai's Trace, the F score was 1.390 and the p-value was .232 ($p < .05$).

Interestingly, the mean pretest scores for nausea and vomiting symptoms were collectively the lowest pretest scores of the symptoms presented on the modified SPAF.

Table 8

Mean scores for nausea and vomiting scores across conditions

	Pretest	Day 1	Day 2	Day 3
Control	2.13	2.00	1.50	1.13
PMR only	2.75	1.50	1.50	1.25
PMR music	2.88	2.50	2.38	1.88

Abdomen pain and discomfort scores across days and conditions

No significant change was indicated using a MANOVA analysis of the abdomen pain and discomfort scores of participants in each condition across the pretest and Days 1-3. Using Pillai's Trace, the F score was .773 (df=8) and the p value was .629 (p<.05).

Table 9

Mean scores for abdomen pain and discomfort scores across conditions

	Pretest	Day 1	Day 2	Day 3
Control	4.50	3.88	2.88	2.25
PMR only	4.63	3.88	4.25	3.63
PMR music	4.58	3.63	3.13	2.50

Tiredness and lethargy scores across days and conditions

A MANOVA analysis of the tiredness and lethargy pretest and Day 1-3 scores of participants in each group indicated no significant change in scores across conditions and time. Pillai's Trace indicated an F score of 1.081 (df=8) and a p value of .397 (p<.05).

Table 10

Mean scores for tiredness and lethargy scores across conditions

	Pretest	Day 1	Day 2	Day 3
Control	4.38	4.25	3.50	2.75
PMR only	4.38	3.75	3.50	3.25
PMR music	3.88	3.25	2.38	1.50

Feelings of bloatedness across days and conditions

For the final symptom on the modified SPAF, a MANOVA analysis indicated no change across conditions or time for the participant's feelings of bloatedness. Pillai's trace indicated an F score of .442 (df=8) and a p value of .888 ($p < .05$). The mean pretest for bloatedness scores across each condition were the highest scores of any symptom on the modified SPAF, with the PMR-only and PMR music group having average pretest scores of 5 or more. Also, it should be noted that although the change was not significant, the decrease in pretest to Day 1 scores of the PMR music group was nearly two points.

Table 11

Mean scores for feelings of bloatedness across conditions

	Pretest	Day 1	Day 2	Day 3
Control	4.75	4.00	3.38	2.63
PMR only	5.00	4.13	3.25	2.87
PMR music	5.13	3.50	3.63	2.88

CHAPTER FIVE

Discussion

Aforementioned, the purpose of this study was to examine the effect of music-assisted PMR on the self-reported pain levels of women with primary dysmenorrhoea during the first three days of their menstrual cycle. An additional purpose of this study was to determine if music-assisted PMR was more effective in reducing self-reported symptom scores than PMR without music. Furthermore, the researcher intended to create a protocol for a music-assisted PMR intervention that can be utilized by other women diagnosed with primary dysmenorrhoea.

Based on the results from this study, there is no clear indication that either the PMR with music condition or the PMR-only condition affected the dysmenorrhoea symptoms of the study participants. Although the total daily symptom scores for the participants in the PMR-only and PMR with music groups decreased over the first three days of their periods, the scores of the control group also decreased. This decrease in symptom scores across all three conditions indicates a normal trend in the decrease of symptoms of women with dysmenorrhoea during the course of the menstrual cycle (Weissman, Hartz, Hansen, & Johnson, 2004). It is important to note that although the difference was not statistically significant, the decrease in total modified SPAF scores between the pretest and Day 1 scores of the PMR with music group dropped nearly six points. This was the most of any of the conditions.

Looking at the individual symptom scores across each condition, there was also generally a decline over time. Although the results were not statistically significant, on a

superficial level, there appears to be the greatest decline in scores among the pretest and Day 1 scores of the PMR-only and PMR-music groups.

Several factors could have contributed to the lack of significance regarding the results within this study. Firstly, the sample size for this study was extremely small (N=24) with each group consisting of eight participants. Multiple studies have indicated the desirability of large (N>100) sample sizes to ensure accurate sampling variability and parameter estimates (Anderson & Gerbing, 1988; Boomsma, 1985; La Du & Tanaka, 1989). Aside from the small sample size, the sample itself was lacking in diversity, specifically in regard to age. The median age of the participants was approximately 23 years of age with no participants above the age of 30. A larger sample with an increased diversity in the age ranges of participants may have yielded alternate results for this study.

Another factor that may have affected the results of this study was that the protocols for the study (the PMR-only and PMR with music) were administered at home by the study participants. Issues related to the reliability and effectiveness of home-administered protocols has been documented in research studies relating to home exercise programs (Guyatt et al, 2001), stress management programs (Krischer, Xu, Meade, & Jacobsen, 2007), pulmonary rehabilitation programs (Jasmer et al, 2001), and self-administered treatments for depression and anxiety (Menchola, Arkowitz, & Burke, 2007). Because the protocol was not administered by the researcher in a controlled environment, the researcher was subsequently unable to minimize the inevitability of distractions that the study participants may have encountered at home. Although the researcher instructed the participants in the PMR-only and PMR with music group to

perform the exercise in a quiet place in their home, participants may have been interrupted by a roommate, the phone, etc., which may have minimized the effectiveness of the exercises. This in turn may have influenced the effectiveness of these conditions and subsequently, the results of this study.

Furthermore, because the study was carried out in the participant's home environment, the researcher was unable to control as to whether or not the participants used other treatment methods to manage their dysmenorrhoea symptoms. Although study participants were instructed to forego any regular home treatments for their dysmenorrhoea symptoms during the course of this study, participants may have used any variety of treatments to manage their symptoms at home (i.e. over-the-counter pain medication, heating pad, massage) unbeknownst to the researcher. The use of any of these treatments may have subsequently skewed the results of the study.

Any study that is centered on self-reported measures could be considered potentially problematic. Common issues that arise in self-reported studies are internal consistency, issues of overreporting and underreporting, and content validity (Huizinga & Elliott, 1986).

Anecdotally, a few participants in this study commented to the researcher on their perceived value of the PMR exercise. One participant in the PMR with music group said that she felt "incredibly relaxed" after completing the exercise and planned to continue to use the CD for not only her next menstrual cycle, but during any time of stress or anxiety. Another participant reported that she had burned copies of the PMR with music CD for her roommates so that they could also do the guided exercise during their menstrual cycles. A participant in the PMR-only group reported that she enjoyed the exercise

because it provided her with a non-pharmacological means of treating the symptoms of her period and planned on continuing to use the exercise in the future.

In conclusion, although this particular study did not yield significant results, further study into this topic is warranted. Reproducing this study using a larger, more diversified sample may produce alternate results. Furthermore, carrying out the study in a more controlled environment other than the participant's home may be desirable for more significant results.

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APPENDIX A

Progressive Muscle Relaxation Exercise

Now, settle back, close your eyes, and let yourself become very, very comfortable. Just let yourself become very, very comfortable.

If you feel any tension or tightness in your body, just let the tension or tightness fade, and let yourself become very, very relaxed.

Begin by concentrating on the feelings in your fingers and in your hands. Concentrate on these feelings, and as you concentrate let any tension, tightness, or constricted feelings—just let those feelings gradually fade—and let yourself feel the relaxation very gradually, very slowly take over. Let those muscles lose any tense or anxious feelings, and let them become very, very relaxed, very calm, very quiet. Just let yourself go. Keep your attention focused on these feelings, and let those muscles become longer and smoother, free of tension and tightness. Just let yourself go. Relaxation produces very loose, very long, and very calm muscles. Just let yourself go.

Now, concentrate on the muscles in your arms, your forearms and upper arms. Put your attention on the muscles in your arms, and when you concentrate let these muscles become very, very relaxed, very quiet, very calm, and let the tension and tightness fade. Just let it go. Let those muscles go deeper and deeper into relaxation. Focus all your attention on those feelings there. If you feel your mind wandering, just bring it back and continue to concentrate on the muscles in the arms and in your hands. Let those muscles become longer, calmer, smoother, and warmer. Let them remain very, very still...very, very tranquil. Just let yourself go. Let your shoulders just hang there very, very heavily. Very heavy. Let them continue to get heavier and heavier and heavier. Sometimes

relaxation occurs in stages, and at other times it is a very gradual, smooth process. Just continue to focus on those feelings, and let the relaxation take over more and more of those muscles. And, then, let that calm, quiet feeling take over your entire body.

As your shoulders become more and more relaxed, also let your upper arms, your forearms, your hands, and your fingers become even more relaxed. Deeper and deeper into a state of relaxation.

Now, concentrate on the muscles in your back, in the lower and upper parts of your back. Let those muscles also become very calm, very smooth, quiet and tranquil. Just let them become very, very relaxed, free of any tensions or any tightness. If you feel any tension or tightness at all, just let a feeling of relaxation replace it. Just let the tenseness and tightness fade very gradually from your body and be replaced by one of relaxation and calmness. Just let yourself go; let it happen to you. Let the relaxation sweep over your body.

And now, the muscles in the back of your neck: Pay particular attention to these muscles, as they become longer and smoother, quieter and calmer. Focus your attention on these feelings in the back of your neck. Concentrate. If you feel any tension or tightness remaining in those muscles, continue to let them relax and lose that tense, tight feeling. Just let yourself go. Let the muscles in the back of your neck become relaxed, and as they become relaxed let your entire body go deeper and deeper and deeper into relaxation. Let yourself go.

Now, the muscles around your jaw: Just let your jaw open to a place that's very comfortable, very quiet and calm, so you don't feel any pulling or contraction of muscles. There shouldn't be any tension there at all. Let that feeling of relaxation take over those

muscles and let it become very, very relaxed, free of tension and free of tightness. Just let yourself go. Concentrate on the feelings on the muscles in your jaw. Your lips might part slightly, as your jaw becomes very, very relaxed. Just let your jaw find that place where it's very calm, very quiet, so it feeling like there's no tension or tightness. And, as your jaw becomes more and more relaxed, begin to focus on the muscles in the rest of your face...your mouth, your cheeks, your forehead. Let those muscles also lose any tense or tight feelings they may have; let them become very tranquil, very smooth, very calm. Just let yourself go. Let yourself go.

Now, focus on the muscles in your stomach. Let those muscles also become very limp and very heavy, very calm, very peaceful. Let the feelings of relaxation replace any constricted or tight feelings you may have. If you feel any tension or tightness at all, concentrate on those feelings, and let those muscles become more and more relaxed. Let them become more and more relaxed. Just let yourself go...Let yourself go. As your stomach becomes more relaxed, let your entire body just sink deeper and deeper and deeper into relaxation...your entire body.

Now, concentrate on the muscles around your legs: your shins, calves, and thighs. Just let all the parts of your legs go very, very deeply into relaxation. Let those muscles become totally calm, totally quiet, and very, very relaxed. Just let yourself go. Let yourself go. Concentrate on the muscles in your legs. If there's any residual tension or tightness or feelings of anxiety, let those feelings just fade away and be replaced by feelings of tranquility, peace and calmness...feel them become longer and smoother, calmer and quieter. Keep your attention focused on relaxation. If your mind wanders, just bring it back, and continue focusing on those feelings.

Let yourself become very, very relaxed, very quiet, very calm. Let your feet, your legs, your stomach, the muscles in your face, your neck—just let all those muscles become very, very tranquil; very, very loose. Let your breathing become very free and very even. Let your whole body just sink down very passively. Let your arms and your legs and your back and your head become very, very limp. Just let yourself go. Let all those muscles become very, very limp; very tranquil. Feel deep relaxation throughout your whole body.

Just let all the parts of your body become very, very heavy; very quiet; and very calm. Just let yourself go. Let yourself go deeper and deeper into relaxation. You are very, very relaxed.

In this relaxed state, your focus is calmer and keener. Your concentration is free of worries and tension. You can think more clearly and handle things more calmly and effectively. Now that you have learned to completely relax, you can attain this relaxed state any time you wish. Just get into a comfortable position, take several deep breaths, and relax your muscles, group by group...relax your feet, your legs, your stomach, your back, your shoulders, your face, and your neck. Just relax the muscles and let go.

You won't fall asleep, but you will feel rested. Your mind will be free of distractions. You'll feel energized. As you gradually stretch your relaxed muscles, and open your eyes slowly, bringing your concentration back to this room, you'll feel refreshed, and the pleasant state of relaxation will stay with you. Welcome back! (Sebenick, 2001).

APPENDIX B

Modified Shorted Premenstrual Assessment Form

For each of the symptoms listed below, circle the number that most closely describes the intensity of your menstrual symptoms. Rate each item on this list on a scale from 1 (not present or no change from usual) to 6 (extreme change, perhaps noticeable even to casual acquaintances).

Headaches	1	2	3	4	5	6
Feeling unable to cope or overwhelmed by ordinary demands	1	2	3	4	5	6
Feeling sad or blue	1	2	3	4	5	6
Backaches and/or leg pain	1	2	3	4	5	6
Outbursts of irritability or bad temper	1	2	3	4	5	6
Tenderness of breasts	1	2	3	4	5	6
Nausea, vomiting, or diarrhea	1	2	3	4	5	6
Discomfort or pain in abdomen	1	2	3	4	5	6
Fatigue or lethargy	1	2	3	4	5	6
Feeling bloated	1	2	3	4	5	6

APPENDIX C

Daily Symptom Calendar

For each of the symptoms listed below, circle the number that most closely describes the intensity of your menstrual symptoms once a day for the first three days of your next period. Rate each item on this list on a scale from 1 (not present or no change from usual) to 6 (extreme change, perhaps noticeable even to casual acquaintances).			
Day of Period	1	2	3
Headaches			
Feeling unable to cope or overwhelmed by ordinary demands, feeling under stress			
Feeling sad or blue			
Backaches and/or leg pain			
Outbursts of irritability or bad temper			
Tenderness of breasts			
Nausea, vomiting, or diarrhea			
Discomfort or pain in abdomen			
Fatigue or lethargy			
Feeling bloated			