Clinical and Experimental Health Sciences

The Effects of Music Listening on Pain, Anxiety, and Quality of Life in Patients with Chronic Low Back Pain

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ABSTRACT

Objective: The aim of this study was to investigate the effects of music listening on pain, anxiety and quality of life in Chronic Low Back Pain (CLBP) patients.

Methods: This randomized controlled trial included 60 patients aged 30-50 with CLBP. Participants were randomly assigned to either a control group receiving standard physiotherapy or a music group receiving the same physiotherapy accompanied by music listening. Pain intensity, anxiety levels, and quality of life were assessed using the Visual Analogue Scale (VAS), Beck Anxiety Inventory (BAI), and SF-36, respectively, at baseline and after a 4-week intervention.

Results: Both groups showed significant reductions in pain and anxiety post-intervention, with more pronounced improvements in the music group ($p<.05$). The music group also demonstrated significant enhancements in physical function, emotional role, and pain perception on the SF-36 ($p<.05$), while other subscales showed no significant changes ($p>.05$).

Conclusion: Music listening, as an adjunct to conventional physiotherapy, effectively reduces pain and anxiety while improving certain aspects of quality of life in CLBP patients. These findings support the inclusion of music therapy as a complementary approach in the management of chronic pain.

Keywords: Physical Therapy, Low back pain, Music

1. INTRODUCTION

Low back pain (LBP) is one of the leading causes of disability worldwide. According to the World Health Organization (WHO), 619 million people worldwide will suffer from LBP in 2020 (1). Due to population growth and ageing, the number of people with LBP is expected to reach 843 million worldwide by 2050 (2). Low back pain leads to loss of working days and is an economic burden on societies. Low back pain is therefore an important public health problem (3).

Low back pain is classified according to the duration of symptoms as acute (<6 weeks), subacute (6-12 weeks) and chronic (>12 weeks). Acute low back pain usually resolves spontaneously and lasts less than 6 weeks. However, in some patients the pain may recur after the acute phase and progress to chronic low back pain (4).

The treatment programme for low back pain should be planned according to the patient's symptoms. The main aim of treatment is to improve function and reduce pain. However, it is important for the patient to avoid situations that may trigger symptoms in the future and to adopt a healthy lifestyle (5).

Treatment options include patient education, pharmacological treatment, physiotherapy and rehabilitation approaches, minimally invasive applications, passive modalities and surgical treatment approaches. The first step in treatment is usually conservative management. The most commonly used conservative treatment is exercise (6). Studies show that exercise is effective in relieving low back pain, improving functionality, increasing muscle endurance and flexibility, reducing the risk of pain recurrence, and improving quality of

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life. Physical activity has also been reported to reduce anxiety symptoms and improve emotional and psychological status (7, 8).

One of the alternative methods of pain management is music therapy. Music is one of the oldest and most deeply rooted forms of expression in human history. It has been used for therapeutic purposes in many cultures since ancient times (9). It has a powerful effect on the emotional states of individuals. Music listening is a method used for individuals to achieve emotional relaxation by listening in the background without actively participating in the music (10). Studies have found that music therapy improves general mood of people, reduces perceived pain and decreases anxiety levels. Patients receiving music therapy have been shown to have better outcomes than those receiving standard care alone (11). It is thought that music therapy can improve people's quality of life by reducing pain levels and the need for medication, and by controlling stress and anxiety (12).

Although there are studies in the literature that indicate the positive effects of listening to music on health, there are no studies on CLBP. This study aims to investigate the effects of music listening on low back pain, anxiety and quality of life. The results of the study will inform the integration of alternative and complementary health approaches by understanding the contribution of music to the psychological and physical health of individuals and how it can be used in treatment processes.

2. MATERIAL AND METHOD

2.1. Patients

The study was conducted in a private hospital between March 2024 and August 2024. The study included 60 volunteer patients, aged between 30-50 years, who were diagnosed with chronic low back pain by a physical medicine and rehabilitation physician. Patients were randomly divided into control (n=30) and music groups (n=30). Patients with low back pain for more than 3 months and pain intensity of 5 or more on a visual analogue scale (VAS) were included in the study. Patients who regularly took painkillers or antidepressants and cortisone, those with serious chronic conditions, and those who had spinal surgery were excluded from the study.

2.2. Randomization

The trial was designed as a single-blind, randomised, prospective trial. Two different treatment options for randomisation were created on a computer by a statistician and numbered from largest to smallest by placing them in envelopes. Sixty patients were divided into two groups using the sequential randomisation method. The person administering the treatment opened the envelopes in turn and applied the treatment in the envelope according to the number of patients. The different physiotherapists performed the conventional physiotherapy and these physiotherapists were not changed during the treatment. It was not possible to blind the physiotherapist and the patients. However, the outcome assessor who assessed the clinical measures was unaware of the type of treatment. The Consolidated Standards of Reporting Trials (CONSORT) diagram for participant recruitment is shown in Figure 1.

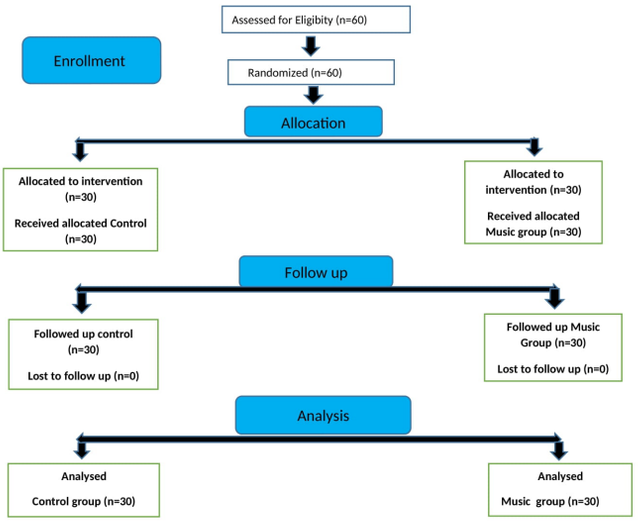

Figure 1. *Study Flow*

2.3. Ethical Consideration

The study was approved by the ethics committee of KTO Karatay University Faculty of Medicine, non-drug and non-medical device research. (Protocol No:2023/042). The study was registered on ClinicalTrials.gov (number: NCT06263803). All patients were given verbal and written information about the study and signed an informed consent form. The trial was conducted in accordance with the ethical principles of the Declaration of Helsinki. Participants gave their informed consent to be included in this study.

2.4. Treatment

Participants in the control group received a classic physiotherapy programme 5 days a week for 4 weeks. This programme included transcutaneous electrical stimulation (TENS) for 20 minutes, hot pack for 20 minutes and ultrasound for 5 minutes (13). For the participants in the music group, Pachabel's Canon in D major (20 min) and Mozart's Sonata for Two Pianos in D, KV 448 (25 min) were played during the classical physiotherapy session, without external sounds (max 70 dB through headphones). These two music parts were chosen because there is evidence that they have a positive effect on cognitive function and reduce anxiety (14, 15).

In addition, participants in both groups were given a patient-specific home exercise programme by a specialist physiotherapist. The exercise programme developed by Koumantakis et al (2005) was used for participants in all groups (16). The programme aims to increase the strength and flexibility of the abdominal, erector spinae, gluteal,

quadriceps and hamstring muscles. The programme begins with lumbar and pelvic stretching and warm-up exercises, followed by strengthening exercises. Participants completed the programme 3 times a day for 4 weeks, doing 10 repetitions of each exercise.

2.5. Outcomes

At the beginning and end of the study, participants' anxiety levels were measured using the Beck Anxiety Scale (BAS), pain intensity using the Visual Analogue Scale (VAS), and quality of life using the SF-36 scale.

The BAS is a 4-point Likert-type scale consisting of 21 items scored from 0 to 3, with raw scores ranging from 0 to 63. The higher the total score, the more anxious the person. BAI scores are categorised as minimal anxiety (0 to 7), mild anxiety (8 to 15), moderate anxiety (16 to 25) and severe anxiety (30 to 63) (17).

VAS is a practical and easy-to-use scale for subjective assessment of pain. A 100 mm straight line is used for measurement. The patient is asked to mark the intensity of the felt pain on this line. On the line, '0' means no pain and '100' means unbearable pain (18).

The SF-36 assesses a person's general health. It consists of a total of 36 questions assessing two basic parameters (mental and physical) and eight sub-parameters (emotional functioning, physical functioning, physical role, social functioning, mental health, general health, vitality and pain). Each parameter can be scored from zero to 100 points. High scores indicate good quality of life (19).

2.6. Sample Size

The sample size calculation was done using a G*power analysis software Version 3.0.10 (G*Power, Franz Faul, Universitat Kiel, Germany). It was calculated according to the previous study examining the effect of conventional physiotheray on chronic low back pain (20). VAS scores was used to estimate the sample size. The analysis indicated that thirty participants for each group were enough to detect a large Cohen's effect (d = 0.75) with an alpha error probability of 0.05 and a power of 80%.

2.7. Statistical Analysis

Statistical Package for the Social Sciences software version 29 (IBM Corp., Armonk, NY, USA) statistical package program was used to evaluate the data. Descriptive statistics (mean, standard deviation, number and percentile) were given for categorical and continuous variables. The conformity of the variables to normal distribution was examined using the Shapiro-Wilk test and histogram method. In the comparison of paired groups, the Indipendent Samples t Test was used for the data fitting the normal distribution and the Mann Whitney U test was used for the data not fitting the normal distribution. Chi-Square test was used to compare categorical data. Within comparison, Wilcoxon test was used due to the fact that the data did not fit the normal distribution. The formula r = z/√N was used to determine the effect size. Statistical significance level p<0.05 was accepted.

3. RESULTS

The study included 60 participants, 32 men and 28 women, aged 44.58 ± 9.41 years, with a mean BMI of 25.85 ± 3.79 kg/m2. The demographic information of the participants is shown in Table 1.

Table 1. *Demographic data of participants*

	Music (n=30) X ± SD / n(%)	Control (n=30) X ± SD / n(%)	t / X2	p
Age	46.97 ± 8.34	42.20 ± 9.94	2.011	.051a
BMI	24.96 ± 2.64	26.75 ± 4.55	1.977	.066 a
Gender				
Male	15 (50,0)	17 (56.7)	.268	.605 b
Female	15 (50,0)	13 (43.3)		

n:number, X: mean, SD: standart deviation, %: percentange, BMI: body mass index; t: Indipendent Sample t Test, X2: Chi-Square, p<.05

Participants' pain (p=.584), anxiety (p=.538) and quality of life scores were similar before the study (Table 2).

Table 2. *Participants' pain, anxiety and quality of life scores*

	Music (n=30) X ± SD	Control (n=30) X ± SD	Z	p
VAS	7.76 ± 1.07	7.83 ± 0.59	.547	.584
BAS	11.33 ± 7.14	10.03 ±6.86	.615	.538
SF36				
Physical Functioning	43.17 ± 26.01	54.17 ± 28.80	1.483	.138
Physical role	36.67 ± 35.19	31.67 ± 39.89	.756	.449
Emotional role	37.77 ± 42.65	23.33 ± 37.29	1.515	.130
Vitality	34.67 ± 19.21	37.83 ± 17.05	.668	.504
Mental	50.80 ± 18.04	57.87 ± 19.33	1.119	.263
Social	57.08 ± 23.37	60.42 ± 25.44	.479	.632
Pain	43.83 ± 17.95	34.41 ± 17.61	1.969	**.049***
General	57.50 ± 17.31	51.00 ± 21.94	1.106	.269

n:number, X: mean, SD: standart deviation, VAS: visual analog scale, BAS: Beck Anxiety Scale, Z: Mann-Whitney U test, p<0.05

In the music group, pain (p<.001, Z=4.822, r=0.88) and anxiety (p=.001, Z=3.308, r=0.60) values decreased after the application. Similarly, in the control group, pain (p<.001, Z=4.821, r=0.88) and anxiety (p=.002, Z=3.173, r=0.57) decreased after the study (Table 3).

Table 3. *within-group comparison before and after the study*

	Music (n=30) X ± SD	Z	p	Control (n=30) X ± SD	Z	p
VAS before	7.76 ± 1.07	4.822	**<.001****	7.83 ± 0.59	4.821	**<.001****
VAS after	3.20 ± 1.32			3.40 ± 1.59		
BAS before	11.33 ± 7.14	3.308	**.001****	10.03 ±6.86	3.173	**.002****
BAS after	9.30 ± 6.12			6.93 ± 5.84		
SF36						
Physical Functioning before	43.17 ± 26.01	4.189	**<.001****	54.17 ± 28.80	0.736	.462
Physical Functioning after	58.50 ± 28.29			57.50 ± 26.84		
Physical role before	36.67 ± 35.19	2.362	**.018***	31.67 ± 39.89	1.779	.075
Physical role after	54.17 ± 35.41			46.67 ± 40.86		
Emotional role before	37.77 ± 42.65	2.047	**.041***	23.33 ± 37.29	2.754	**.006****
Emotional role after	52.22 ± 42.61			46.67 ± 47.63		
Vitality before	34.67 ± 19.21	1.572	.116	37.83 ± 17.05	2.120	**.034***
Vitality after	37.33 ± 18.23			43.83 ± 17.35		
Mental before	50.80 ± 18.04	0.922	.357	57.87 ± 19.33	0.017	.986
Mental after	54.00 ± 16.76			58.40 ± 15.42		
Social before	57.08 ± 23.37	0.458	.647	60.42 ± 25.44	1.872	.061
Social after	56.77 ± 23.64			67.08 ± 21.64		
Pain before	43.83 ± 17.95	2.957	**.003****	34.41 ± 17.61	4.143	**<.001****
Pain after	53.41 ± 18.19			54.83 ± 21.51		
General before	57.50 ± 17.31	0.626	.531	51.00 ± 21.94	3.327	**.001****
General after	57.83 ± 16.85			57.67 ± 22.19		

n:number, X: mean, SD: standart deviation, VAS: visual analog scale, BAS: Beck Anxiety Scale, Wilcoxon, p<0.05

When SF36 and its sub-parameters were evaluated before and after the study in the music group, Physical function (p<.001, Z4.189, r= 0.76), Physical role (p=.018, Z=2.362, r=0.43) Emotionality (p=.041, Z=2.047, r=0.37) and pain (p=.003, Z=2.957, r=0.53) increased, while no change was observed in Vital (p=.126, Z=1.572, r=0.28), Mental (p=.357, Z=0.922, r=0.16) Social (p=.647, Z=0.458, r=0.08) and General (p=.531, Z=0.626, r=0.11) parameters (Table 3).

In the control group, when SF36 and its sub-parameters were evaluated before and after the study, Emotional (p=.006, Z= 2.754, r=0.50), Vital (p=.034, Z=2.120, r= 0.38), Pain (p<.001, Z= 4.143, r= 0.75) and General (p=.001, Z= 3. 327, r=0.60) increased, while no change was observed in Physical function (p=.462, Z= 0.736, r= 0.13), Physical role (p=.075, Z= 1.779, r= 0.43), Mental (p=.986, Z=0.017, r= 0.01) and Social (p=.061, Z= 1.872, r= 0.34) parameters (Table 3).

The participants' post-test pain (p=.812, Z=0.238) and anxiety (p=.108, Z=1.609) values were similar between the groups (Table 4).

Post-test SF36 (p=.964, Z=0.045) and Physical Functioning (p=.929, Z=0.089), Physical role (p=.449, Z=0.757), Emotionality (p=.582, Z=0.550), Vitality (p=.186, Z=1.324), Mental (p=.598, Z=0.257), Social (p=.110, Z=1.600) and Pain (p=.846, Z=0.194) subparameters were similar between groups (Table 4).

Table 4. *Between group comprassion of post-test pain, anxiety and quality of life scores*

	Music (n=30) X ± SD	Control (n=30) X ± SD	Z	p
VAS	3.20 ± 1.32	3.40 ± 1.59	0.238	.812
BAS	9.30 ± 6.12	6.93 ± 5.84	1.609	.108
SF36				
Physical Functioning	58.50 ± 28.29	57.50 ± 26.84	0.089	.929
Physical role	54.17 ± 35.41	46.67 ± 40.86	0.757	.449
Emotional role	52.22 ± 42.61	46.67 ± 47.63	0.550	.582
Vitality	37.33 ± 18.23	43.83 ± 17.35	1.324	.186
Mental	54.00 ± 16.76	58.40 ± 15.42	0.527	.598
Social	56.77 ± 23.64	67.08 ± 21.64	1.600	.110
Pain	53.41 ± 18.19	54.83 ± 21.51	0.194	.846
General	57.83 ± 16.85	57.67 ± 22.19	0.045	.964

n:number, X: mean, SD: standart deviation, VAS: visual analog scale, BAS: Beck Anxiety Scale, Mann Whitney U, p<0.05

4. DISCUSSION

This study aimed to investigate the effects of music listening on low back pain (LBP), anxiety, and quality of life in patients with chronic low back pain (CLBP). The findings reveal that integrating music listening into a conventional physiotherapy regimen significantly reduces pain and anxiety levels, while also improving certain aspects of quality of life, particularly physical function, emotional role, and pain perception. These results contribute to the growing body of evidence supporting the use of music therapy as a complementary treatment modality in managing chronic pain conditions. The significance of these findings lies in the ability of music therapy to address multiple dimensions of well-being in a holistic manner, providing both physical and psychological benefits, which is essential for comprehensive patient care.

The study demonstrated a significant reduction in pain levels in both the music and control groups, as measured by the Visual Analogue Scale (VAS). However, the reduction in pain was more pronounced in the music group. This aligns with existing literature that suggests music has a powerful analgesic effect. Research indicates that music can reduce the perception of pain by engaging cognitive

and emotional pathways that modulate pain sensitivity (21-23). The mechanism through which music achieves this effect may involve the activation of the brain's reward centers and the release of endogenous opioids, which help diminish pain perception (24-26). This is consistent with findings from Cepeda et al. (2013) who reported that music therapy is effective in reducing the intensity of pain in various patient populations, including those with chronic pain (27). These observations suggest that music therapy could be a particularly effective tool in pain management by addressing both the physiological and emotional aspects of pain, thereby offering a more comprehensive approach to patient treatment.

Anxiety levels, as measured by the Beck Anxiety Inventory (BAI), also decreased significantly in both groups, with the music group showing a more substantial reduction. The anxiolytic effects of music are well-documented, with studies suggesting that music can induce relaxation and reduce stress by lowering cortisol levels and stabilizing autonomic nervous system responses (28, 29). In this study, the reduction in anxiety observed in the music group could be attributed to the calming effects of classical music, particularly the selected pieces by Pachelbel and Mozart, which have been shown to have positive effects on cognitive function and mood regulation (30-31). These findings are supported by other research that highlights the role of music in improving psychological well-being and reducing anxiety in clinical settings (32-34). The implications of these results are significant because they demonstrate that music therapy not only alleviates anxiety but also enhances cognitive and emotional stability, which are critical for the overall well-being of patients suffering from chronic pain conditions.

Quality of life, as assessed by the SF-36, showed significant improvements in physical function, emotional role, and pain in the music group. These findings are important because they suggest that music listening not only alleviates physical symptoms but also enhances psychological and emotional well-being. The improvement in physical function is particularly noteworthy, as it indicates that music therapy may contribute to better overall physical health and greater engagement in daily activities (35). This is consistent with the study by Bradt et al. (2007), which found that music therapy significantly improved physical and emotional outcomes in patients with chronic conditions (36). The improvement in these quality of life metrics underscores the potential of music therapy to serve as an effective adjunct to traditional physiotherapy, providing a more holistic approach to improving patient outcomes by addressing both the physical and emotional dimensions of chronic pain.

However, it is important to note that some SF-36 subscales, such as vitality, mental health, social functioning, and general health, did not show significant changes in either group. This could be due to the relatively short duration of the intervention or the specific characteristics of the patient population. Previous studies have shown that longer-term music interventions may be required to observe significant changes in these dimensions of quality of life (37). This finding suggests that while short-term interventions can yield positive results in some areas, a more extended duration of music therapy might be necessary to achieve broader improvements in overall quality of life, particularly in aspects related to mental and social health.

The findings of this study have several clinical implications. First, they support the inclusion of music listening as a complementary therapy in the management of CLBP. Given the low cost, ease of implementation, and minimal side effects, music therapy can be readily integrated into existing treatment protocols to enhance patient outcomes. Second, the study highlights the potential for music therapy to address both physical and psychological aspects of chronic pain, making it a holistic approach to pain management. These implications are particularly relevant in clinical practice, where the need for effective, non-invasive, and cost-effective treatment options is increasingly recognized, and where integrating music therapy could lead to more comprehensive and patient-centered care.

Despite the promising findings, this study has some limitations. The sample size was relatively small, which may limit the generalizability of the results. Additionally, the study duration was short, and the long-term effects of music therapy on pain, anxiety, and quality of life were not assessed. Future research should consider larger sample sizes and longer follow-up periods to better understand the sustained impact of music therapy on chronic pain conditions. These limitations highlight the need for continued research to validate and expand upon the findings of this study, ensuring that music therapy is appropriately tailored and applied to achieve the best possible outcomes for patients with chronic pain.

Implications for physical therapy practice

In this study, positive effects of listening to music were observed in patients with chronic low back pain. As this method is cheap and easy to use, we recommend that it be added to physiotherapy sessions. In addition, this inexpensive method may have a positive effect on the cost of treatment.

5. CONCLUSION

In conclusion, this study provides evidence that music listening can significantly reduce pain and anxiety while improving certain aspects of quality of life in patients with chronic low back pain. These findings suggest that music therapy may be a valuable addition to conventional treatment strategies for CLBP, offering a non-invasive, cost-effective, and easily accessible method to enhance patient care. The integration of music therapy into clinical practice could provide a more holistic approach to managing chronic pain, ultimately leading to better patient outcomes and improved quality of life.

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Author Contribution

Research idea: MST
Design of the study: MST, BSU
Acquisition of data for the study: OT, BD
Analysis of data for the study: HG
Interpretation of data for the study: HG, BD
Drafting the manuscript: BSU, OT, HG
Revising it critically for important intellectual content: MST, BSU, OT
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