LIVE MUSIC, THE NEW, SAFER AND MORE EFFECTIVE PILL ON THE MARKET. A CASE STUDY WITH HEMODIALYSIS PATIENTS IN A HOSPITAL

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ABSTRACT: People are more vulnerable to presenting anxiety, depression, nervousness, unfavorable quality of life, when they face situations that can threaten their life. Among these situations we find the disease, medical treatments and surgical interventions as the main ones on the list. When people get sick they endure very big and sudden changes in their lives, income, aggressive treatments, endure physical pain, these changes usually generate an unfavorable mood situation to face the disease, and in most cases worsen the previous clinical situation. Throughout history there has always been an awareness of the positive effects that music produces on people and society. Music is applied in education, in the expression of emotions, and also in the healing of patients and in many other situations. We can say that music and medicine are two closely related disciplines, with music being increasingly used as an adjuvant in different pathologies. The objective of our study was to verify the effect of classical music heard live on patients, in this case kidney patients undergoing hemodialysis (HD), who have listened to live music while receiving treatment at the Manises hospital.

KEY WORDS: *Music therapy; live music; hemodialysis*.

1. INTRODUCTION

Anxiety (A), depression (D), health-related quality of life (HRQL), are concepts that are directly related to people's health. A and D are almost always in the environment of another disease, since the limitations, worries or life changes that it produces are the main triggers. On the other hand, HRQoL is a much broader concept that encompasses several dimensions, physical, mental, and social, and is used to assess the general well-being of patients. The patient with chronic kidney disease (CKD) is frequently diagnosed with anxiety and depression. Both the emotional state that anxiety produces, as well as the multiple disorders that depression entails, can become chronic and lead you to lose the ability to take care of daily tasks and obligations. (Palacios, 2014). Generally, they also present a HRQL lower than the reference values of the general population.

There are many works prior to our research where these concepts have been valued in different pathologies, and many of these studies have been carried out through music therapy, where they have shown the great beneficial impact that music has in reducing stress levels, anxiety and depression. (Arias, 2007; Guyton & Hall, 1967; Lamping, 2004; Abram, 1969; De-Nour, 1970; Antoci, 2016; Augé et al., 2015; Firmeza et al., 2017; Serrano & Carrascosa, 2020; Cukor et al., 2008). However, we did not find studies where the application of music was done directly with musicians and live music on kidney patients, our research is based mainly on this fact.

We have evaluated the effect of classical music heard live on anxiety, depression and quality of life in kidney patients undergoing hemodialysis treatment. We also try to provide data and verify whether classical music can reduce the high levels of anxiety and depression that surround this disease as part of the treatment. We also verify whether this direct and "in situ" intervention during hemodialysis treatment has an effect on the quality of life of patients.

2. METHODOLOGY

We conducted the research through a group randomized clinical trial, 90 patients agreed to participate. They were randomized into an intervention group (IG) and a control group (CG). The IG listened to 30/45 minutes of live classical music in two of the three weekly HD sessions for 1 month. The CG followed his usual treatment.

Different individual scales of the kidney disease quality of life test (KDQOL-SF) were analyzed at two time points, baseline (start) and later (end) of the musical intervention in both groups. At the same time, grades A and D were also analyzed before (pre) and after (post) the musical intervention in both groups, using the Hospital Anxiety and Depression (HAD) scale.

The analysis was performed using a mixed linear regression model, with independent variables (age, sex, months in treatment, Kt / v, Hemoglobin (Hb)) and dependent variables (HAD scale score and individual KDQOL-SF scale scores).

Musical intervention

The music application is done live and directly and not through recordings, with sessions of between 30 and 45 min each. There are 4 sessions per week for 1 month. All the participating musicians are professionals, orchestral musicians and conservatory teachers. A great diversity of chamber groups are organized and works from different periods and styles are played, from Bach, Beethoven or Mozart, to current music by groups such as Queen or other famous Spanish groups. It was organized in such a way that all patients could listen to the same groups and the same musical pieces, thus avoiding any bias.

3. RESULTS

120 patients were selected for the study, 92 agreed to participate and the sample was finally reduced to 90, one patient was eliminated due to death and the other due to hospital transfer. The clinical and demographic characteristics of the patients included in this study are specified in Table 1.

Table 1. Clinical and demographic characteristics of the population included in the study.

	CG Group (n = 43)	IG Group (n = 47)
Age (years)		
Average (SD)	75,81 (9,67)	73,53 (10,91)
Median (IQR)	79 (70,5; 83)	75 (67; 81,5)
Sex		
Male n (%)	22 (51,16%)	18 (38,30%)
Female n (%)	21 (48,83%)	29 (61,70%)
Intervention months		
Average (SD)	60,47 (41,10)	63,34 (52,35)
Median (IQR)	49 (30,5; 89)	59 (23; 86)
Kt/v		
Average (SD)	1,54 (0,18)	1,48 (0,38)
Median (IQR)	1,54 (1,45; 1,69)	1,40 (1,30; 1,60)
Serumhemoglobin (g/dl)		
Average (SD)	11,56 (1,05)	11,32 (1,12)
Median (IQR)	11,60 (10,80; 12,15)	11,30 (10,70; 12,15)
Serumalbumi (g/dl)		
Average(SD)	3,87 (0,42)	3,77 (0,43)
Median (IQR)	4 (3,8; 4)	4 (3,6; 4)
Systolic blood pressure (mmHg)		
Average (SD)	133,98 (28,49)	137,34 (20,13)
Median (IQR)	139 (117; 153,5)	140 (122,5; 150)
Diastolic bood pressure (mmHg)		
Average (SD)	56,09 (12,25)	58,70 (12,17)
Median (IQR)	58 (46,5; 64)	57 (49,5; 65)
Type of vascular access		
CVC n (%)	9 (20,93%)	8 (17,02%)
AVF n (%)	34 (79,07%)	39 (82,98%)

CG, control group;IG, intervention group;SD, standard deviation;IQR, interquartile range;AVF, arteriovenous fistula;CVC, central venous catheter.

The results of the statistical analysis in terms of HRQoL show that the difference between the time before and after the IG with respect to the CG increased the mean score (pm) significantly in 18 of the 21 scales of the test (Table 2).The results indicate that the control and intervention groups have evolved differently between the two time instants, and that this difference in evolution is significant in 18 scales of the test.

Table 2. ResultsKDQOL-SFscale.

Variable	Group	Mean (SD) Pre-intervention	Post-interventión	Estimation* (CI 95%): Interaction time×group	*p*-value
Symptoms and problems	CG	64,63 (18,27)	63,07 (16,88)	15,78 (10,00 - 21,56)	**<0.001**
	IG	66,31 (17,97)	80,54 (13,09)		
Effects of kidney disease	CG	42,51 (21,05)	39,31 (18,60)	14,96 (9,16 - 20,76)	**<0.001**
	IG	45,88 (24,11)	57,64 (19,10)		
Burdenkidneydisease	CG	29,79 (14,99)	26,59 (15,79)	16,36 (7,76 - 24,96)	**<0.001**
	IG	30,31 (25,60)	43,48 (23,99)		
Employmentsituation	CG	38,37 (21,37)	44,18 (19,54)	-5,81 (-12,20 - 0,57)	0.078
	IG	38,29 (23,80)	38,29 (25,98)		
Cognitivefunction	CG	23,56 (17,83)	24,49 (17,86)	-17,52 (-24,60 - 10,44)	**<0.001**
	IG	25,10 (24,44)	8,51 (10,37)		
Quality of social relationship	CG	16,89 (14,78)	17,36 (14,11)	-14,22 (-20,55 - 7,89)	**<0.001**
	IG	22.69 (23.45)	8,93 (10,42)		
Sexual function	CG	14,53 (28,46)	13,95 (28,50)	7,76 (1,59 - 13,93)	**0.016**
	IG	30,05 (37,37)	37,23 (41,82)		
Quality of sleep	CG	51,80 (22,14)	49,94 (23,32)	21,59 (15,13 - 28,05)	**<0.001**
	IG	50,47 (26,03)	70,21 (22,56)		
Social support	CG	68,21 (18,83)	68,21 (16,98)	4,61 (-2,93 - 12,15)	0.234
	IG	72,69 (27,01)	77,30 (22,90)		
Personal attitude	CG	85,17 (21,34)	84,59 (23,43)	8,29 (1,98 - 14,59)	**0.012**
	IG	79,52 (25,19)	87,23 (17,77)		
Satisfaction	CG	80,23 (20,33)	79,45 (20,52)	4,32 (-0,07 - 8,71)	0.057
	IG	74,82 (23,28)	78,36 (18,03)		
Physicalfunction	CG	29,76 (26,79)	28,25 (27,03)	26,08 (19,32 - 32,84)	**<0.001**
	IG	30,31 (26,23)	54,89 (27,17)		
Physical role	CG	25,00 (40,08)	29,65 (40,18)	46,41 (28,09 - 64,72)	**<0.001**
	IG	26,06 (38,64)	77,12 (39,29)		
Pain	CG	43,60 (34,78)	36,04 (31,49)	41,92 (29,04 - 54,79)	**<0.001**
	IG	42,44 (31,84)	76,80 (30,87)		
General health	CG	33,72 (13,23)	31,86 (13,00)	11,96 (7,14 - 16,78)	**<0.001**
	IG	30,42 (20,79)	40,53 (19,62)		
Emotionalwell-being.	CG	54,60 (23,83)	51,07 (24,36)	29,57 (21,13 - 38,01)	**<0.001**
	IG	53,61 (30,73)	79,66 (20,88)		
Emotional role	CG	70,54 (45,54)	55,81 (47,54)	43,09 (22,92 - 63,26)	**<0.001**
	IG	58,15 (46,86)	86,52 (31,59)		
Social function	CG	61,62 (28,53)	50,87 (28,66)	43,20 (32,40 - 54,00)	**<0.001**
	IG	52,39 (31,67)	84,84 (23,15)		
Vitality	CG	28,95 (24,21)	23,48 (21,14)	25,46 (18,62 - 32,30)	**<0.001**
	IG	35,00 (27,28)	55,00 (24,71)		
Changes	CG	43,60 (22,55)	36,04 (22,02)	15,53 (4,67 - 26,40)	**0.006**
	IG	50,53 (30,16)	58,51 (28,68)		
General health(Total)	CG	44,41 (18,68)	39,53 (15,88)	23,39 (15,26 - 31,52)	**<0.001**
	IG	45,31 (24,92)	63,83 (19,95)		

The estimate reflects the interaction between the time instant and the group, obtained through mixed linear regression models. More specifically, the estimate indicates the difference between the temporal evolution (post-intervention time minus pre-intervention time) of the IG with respect to the temporal evolution of the CG for each of the study variables. In this case, a positive estimate indicates that the variable has increased its value in the IG after the intervention and in a greater amount than in the CG.

On the other hand, when analyzing the dependent variables A and D at the two moments in time, it is also observed how CG and IG evolve differently and diverge with the progression of time. In Figure 1 it can be seen that at the post-intervention time there is a decrease in the degree of anxiety and depression in the IG and a slight increase in the degree of anxiety and depression in the CG, starting from a similar level of anxiety and depression. Statistical analysis using mixed linear regression models (Table 3) also confirms that this divergence in the evolution of both groups is significant. Specifically, anxiety in the IG undergoes a significant decrease ($p<0.001$) that differs by 5.35 points with respect to the difference in anxiety in the CG between the two time instants. On the other hand, depression in the IG undergoes a significant decrease ($p<0.001$) that differs by 5.88 points with respect to the difference in depression in the CG between the two time instants.
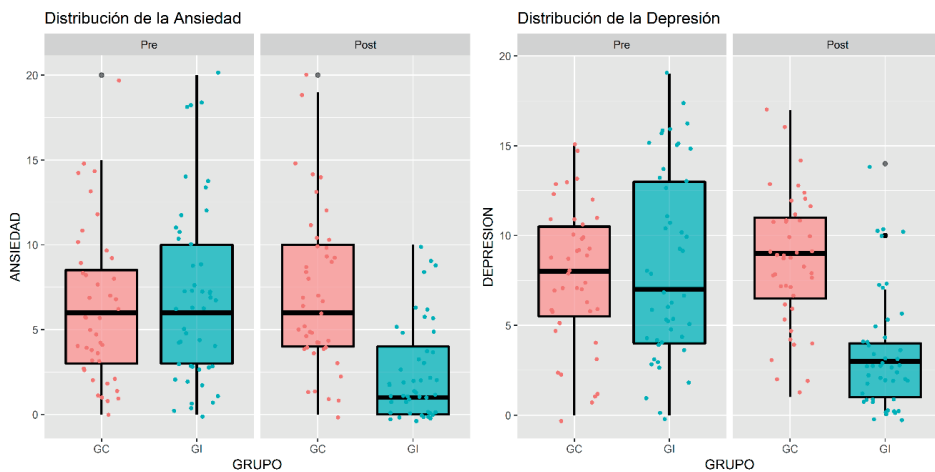
Box-whisker graph showing the distribution of Anxiety and Depression levels for the control group (CG, red) and the intervention group (IG, green) in the two time instants analyzed (pre and post-intervention).It is observed how the values of both levels are considerably reduced in the IG after applying the intervention but instead increase slightly in the CG.

Figure 1. Distribution of Anxiety and Depression for groups.

Table 3. Temporal evolution of Anxiety and Depression levels for the control group (CG) and the intervention group (IG).

Variable	Group	Mean (SD)		Estimation* (CI 95%): Interaction time × group	*p*-value
		Pre-intervention	Post-intervention		
Anxiety	GC	6,30 (4,50)	7,18 (4,71)	-5,35 (-6,74 - -3,96)	**<0,001**
	GI	6,95 (5,20)	2,48 (2,76)		
Depresion	GC	7,69 (3,87)	8,58 (3,66)	-5,88 (-7,20 - -4,55)	**<0,001**
	GI	8,40 (5,22)	3,40 (3,24)		

4. CONCLUSIONS

Music and medicine have been united since ancient times, this therapeutic union has grown little by little according to the beliefs and customs of different societies, until what we know today as music therapy.

Music has become a complementary therapeutic tool, a powerful stimulus for our brain (Sacks, 2006). Thanks to new neuroimaging techniques such as functional Magnetic Resonance for example (functional MRI), we are beginning to discover what happens in a normal brain when music is played, and how the structure and function of the brain can be modified with music training (Miranda et al., 2017). In recent years, interest has grown in using music as a therapeutic tool for neuronal rehabilitation. Novel methods based on music have been developed to improve deficits of different types and pathologies. For example, music therapy has been used in children and adolescents with autism and dyslexia. (Geretsegger et al., 2014; Flaugnacco et al., 2015), in adults affected by cerebrovascular accident (Altenmüller & Schlaug, 2015), Parkinson's disease (Bloem et al., 2015), also in Oncology, ICU, Surgery, even in patients with kidney disease undergoing hemodialysis treatment (Konopacki, 2016).

Most of these studies assess the therapeutic effect of music and the effect that it produces on anxiety, stress, pain, however the musical application in most cases has not been carried out in a direct way but ina passive way through recorded music. One of the innovations of our study is the fact that classical music has been performed live in the hospital itself, while the patients received HD treatment. This direct contact, both visual and auditory, we believe could enhance the effect produced and should be the subject of future studies.

The results of the research show that music can significantly reduce the levels of anxiety and depression in kidney patients without the need to take chemical drugs, likewise we have also shown that with this type of musical intervention, it improves the quality of life related to Self-perceived health in patients with chronic kidney disease.

Music is harmless to health, it is an art, a gift of life, it is the most natural medicine and without side effects. Its constant and regular use within hospitals would allow us to save on other types of chemical drugs, in addition to improving the motivation of both patients and health personnel through it. We hope that in the not too distant future it will

be used as a regular part of treatment in various pathologies, perhaps this is the most human value of music: to be used as a tool to help heal.

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