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review

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## Non-pharmacological strategies to decrease anxiety in cardiac catheterization: integrative review

*Estratégias não farmacológicas para diminuição da ansiedade no cateterismo cardíaco: revisão integrativa*  
*Estrategias no farmacológicas para disminuir la ansiedad en el cateterismo cardíaco: revisión integradora*

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### ABSTRACT

**Objective:** to identify and review the literature on non-pharmacological strategies used for reducing anxiety in patients receiving cardiac catheterization. **Method:** this study was an integrative literature review. The research was conducted using the databases LILACS, SciELO, Medline (through BVS and PubMed) and Scopus. Studies were analyzed according to their objective, method, instruments used for evaluating patients' anxiety, and the results obtained. **Results:** the most used strategy for reducing anxiety in patients receiving cardiac catheterization was music therapy. However, no study identifying the most appropriate time for this intervention (before, during and/or after the procedure) was found. Other strategies identified in this review were educational videos, massage, and palm therapy. **Conclusion:** the results found suggest that anxiety can be reduced using non-pharmacological strategies. **Keywords:** Anxiety; Nursing; Cardiac Catheterization.

### RESUMO

**Objetivo:** identificar na literatura estudos que abordam as estratégias não farmacológicas utilizadas para redução da ansiedade de pacientes que se submetem ao cateterismo cardíaco. **Método:** trata-se de uma revisão integrativa da literatura, realizada nas bases de dados LILACS, SciELO, Medline (via BVS e PubMed) e Scopus. Os estudos foram analisados de acordo com seu objetivo, métodos, instrumentos utilizados para avaliar ansiedade dos pacientes e resultados obtidos. **Resultados:** a musicoterapia foi a estratégia mais abordada para a redução da ansiedade. Entretanto, não foi encontrado nenhum estudo que identificasse o momento mais adequado para esta intervenção (antes, durante e/ou após o procedimento hemodinâmico). Outras estratégias identificadas nesta revisão foram o vídeo educacional, massagem e terapia na palma das mãos. **Conclusão:** os resultados encontrados sugerem que a ansiedade pode ser diminuída com o emprego de estratégias não farmacológicas. **Descritores:** Ansiedade; Enfermagem; Cateterismo Cardíaco.

### RESUMEN

**Objetivo:** identificar y revisar los estudios de literatura que abordan las estrategias no farmacológicas utilizadas para reducir la ansiedad en los pacientes que reciben un cateterismo cardíaco. **Método:** revisión integradora. La investigación se llevó a cabo utilizando las bases de datos LILACS, SciELO, Medline (BVS y PubMed) y Scopus. Los estudios se analizaron de acuerdo con sus objetivos, la metodo, los instrumentos utilizados para la evaluación de la ansiedad de los pacientes, y los resultados obtenidos. **Resultados:** la estrategia dirigida más para reducir la ansiedad en los pacientes que recibieron cateterización cardíaca fue la musicoterapia. No se encontró estudio, sin embargo, identificando el momento más adecuado para esta intervención (antes, durante y / o después de este procedimiento). Otras estrategias identificados en esta revisión eran videos educativos, masajes y terapia de palma. **Conclusión:** los resultados sugieren que la ansiedad se puede reducir el uso de estrategias no farmacológicas. **Palabras clave:** Ansiedad; Enfermería; Cateterismo Cardíaco.

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## INTRODUCTION

Cardiovascular diseases are the main causes of morbidity and mortality worldwide. According to the American Heart Association (AHA), more than 2,150 Americans die of cardiovascular diseases each day, an average of one death every 40 seconds<sup>(1)</sup>. Projections suggest that by 2030, 40.8% of the American population will have some cardiovascular disease<sup>(1)</sup>.

In patients with ischemic heart disease, acute coronary syndrome is the most dramatic and frightening condition. The treatment for ischemic heart disease can be clinical (by using drugs), surgical (consisting of myocardial revascularization when cardiac catheterization indicates severe obstructive lesions) or vascular (angioplasty), depending on the patient's clinical situation and the degree of coronary artery obstruction<sup>(2)</sup>. Vascular procedures consist of percutaneous coronary intervention, and the method of accessing the heart and the coronary arteries is cardiac catheterization, which can be classified as primary (performed under emergency circumstances) and elective (performed without emergency circumstances)<sup>(3)</sup>. Coronary patients undergoing cardiac catheterization experience several unpleasant feelings, including anxiety, fear, discomfort and distress, anxiety being one of the most common<sup>(4-5)</sup>.

Anxiety is characterized by symptoms such as palpitations, sweating, trembling or shaking, shortness of breath or smothering sensations, chest pain or discomfort, and/or stomach distress<sup>(6)</sup>. Anxiety activates the sympathetic nervous system leading to a variety of physiological responses<sup>(7)</sup>, such as tachycardia, sweating, increased oxygen consumption, hypertension, which can worsen the evolution of the patient. In addition, anxiety can have a negative effect on a patient's clinical outcomes such as treatment refusal and reduced tolerance to pain before, during and after the catheterization intervention. Nurses should implement effective non-pharmacological strategies in order to control patients' anxiety.

In this context, identifying non-pharmacological strategies to reduce anxiety in patients undergoing cardiac catheterization is very important to improve nursing care and to prevent the negative effects of anxiety on patients' clinical outcomes, such as tachycardia and chest pain. To our knowledge, no literature reviews to date have identified non-pharmacological strategies to reduce anxiety in this patient population despite the need for this type of research.

The objective of this review was to identify studies in the published literature about non-pharmacological strategies to reduce anxiety in patients who underwent cardiac catheterization.

## METHOD

An integrative literature<sup>(8-9)</sup> review was performed in the databases LILACS, SciELO, Medline (through BVS and PubMed) and Scopus. The controlled descriptors

used for article search in the databases included "anxiety" and "cardiac catheterization" or "catheterization", and the key-word "apprehension". Inclusion criteria for article selection were studies published from 2002 to 2014, in Portuguese, English or Spanish.

Titles and abstracts were concurrently read and analyzed independently by two researchers, who compared and selected studies to be included. Studies that met all the inclusion criteria were fully read by both researchers. In addition, we included studies in the review that were cited by the articles originally selected but not identified in the databases when the controlled descriptors were used. The authors of the articles that could not be obtained in full through the databases were contacted electronically (Figure 1).

Data from the selected articles were extracted by three researchers using an instrument validated by Ursi<sup>(10)</sup>, ensuring that all relevant data were extracted. The instrument includes

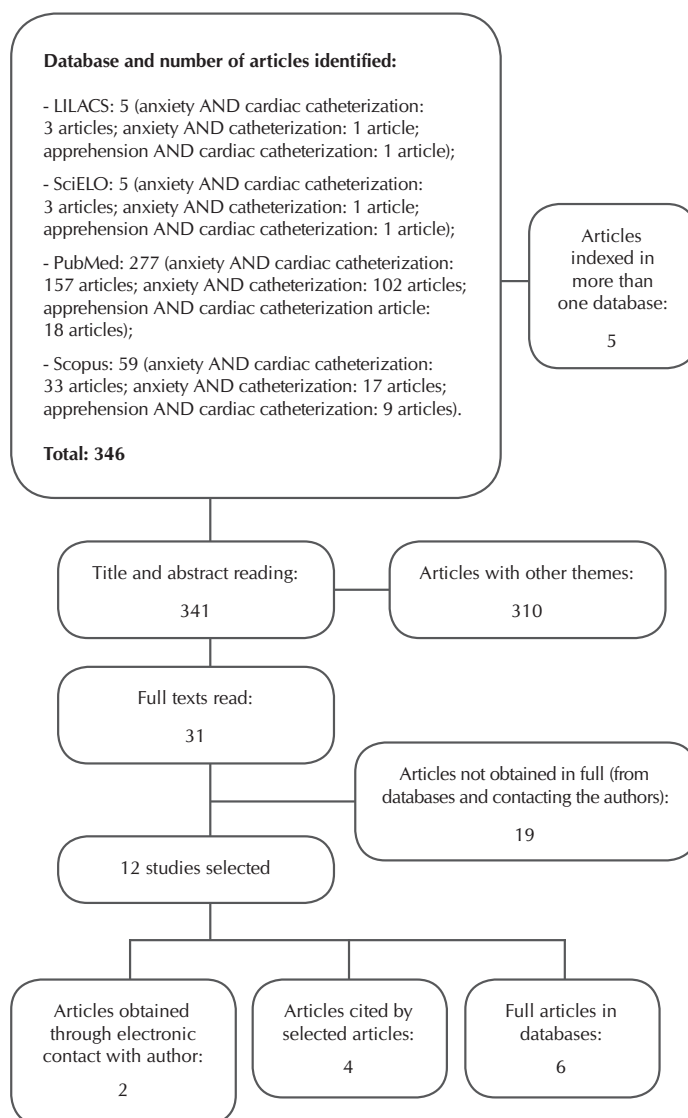


Figure 1 - Article retrieval and selection, São Paulo, Brazil, 2015

identification of article, journal, authors, country, language, year of publication, institution where the study is based, type of publication, objective or research question, sample, data analysis, interventions, results, analysis, implications, level of evidence and limitations of the study.

The methodological quality of the articles was evaluated through the Jadad scale. This is an instrument with 3 items (randomization, blinding and an account of all patients), totaling 5 points, with a minimum possible score of 2<sup>(11)</sup>. Studies with more than 3 points were considered of good quality.

## RESULTS

The twelve selected studies were all clinical trials (two non-randomized) and published in English<sup>(12-23)</sup>, in 2012 (n=1), 2011 (n=2), 2009 (n=3), 2008 (n=1), 2006 (n=1), 2004 (n=1), 2003 (n=2), and 2002 (n=1). The continent where most of them were developed was Asia (5 studies, from Iran, Israel, China, Taiwan and Japan), followed by North America with 4 studies (2 from the USA and 2 from Canada), while 2

studies were developed in Germany and 1 in Australia. In addition, all cardiac catheterizations were elective procedures. The non-randomized clinical trials used music<sup>(12)</sup> and educational videotapes<sup>(13)</sup> as strategies to reduce patients' anxiety. Lee et al.<sup>(12)</sup> randomized patients based on the day of the procedure (patients submitted to the procedure on Wednesdays were assigned to the control group and patients submitted to the procedure on Thursdays were assigned to the intervention group). Chair et al.<sup>(13)</sup> randomized patients into two groups based on the presence of patients at the pre-admission educational assessment session (patients who were present at the pre-admission assessment session were allocated to the experimental group, whereas the remaining patients were allocated to the control group).

Box 1 shows that the instruments most frequently used to assess patients' anxiety were Spielberger's State-Trait Anxiety Inventory (n=9), the Visual Analogy Scale (n=3), the Numerical Value Scale (n=2) and the Depression, Anxiety and Stress Scale (DASS-21) (n=1); three of the studies reviewed used two distinct scales to assess patients' anxiety<sup>(14-16)</sup>.

**Box 1 -** Distribution of the selected studies by objectives, intervention, number of participants, instrument, the moment when anxiety was assessed, main results and Jadad scale (quality of reports of randomized clinical trials), São Paulo, Brazil, 2015

Aims / Jadad Scale	Intervention	Number of participants/ Mean age (years) and gender	Assessment tools/ Time points	Main results
To identify the effect of music on anxiety levels in Chinese patients before cardiac catheterization <sup>(12)</sup> . <b>Jadad Scale: 0</b>	<b>Intervention group:</b> music therapy according to the patient's preference (sounds related to the East European/ Western style and popular Chinese music), with a duration of 20 to 40 minutes, in a reclining chair before cardiac catheterization. In addition to music therapy, patients received routine pre-procedure information such as guidance about cardiac catheterization. <b>Control group:</b> routine pre-procedure information such as guidance about the cardiac catheterization, after which the patients performed relaxation activities for 20 to 40 minutes, such as reading or watching television in a waiting room.	<b>Total sample:</b> 113 <b>Intervention group:</b> 58 <b>Mean age:</b> 50.0 <b>Gender:</b> 27 females <b>Control group:</b> 55 <b>Mean age:</b> 51.9 <b>Gender:</b> 28 females	<b>Instruments:</b> anxiety: State-Trait Anxiety Inventory; blood pressure, heart rate and respiratory rate: instrument that assesses vital signs. <b>Time points:</b> anxiety: on the day of the procedure, after the patient's arrival, and 10 minutes after the intervention; vital signs: on the day of the procedure, after the patient's arrival, and 10 minutes after the intervention.	All the participants chose popular Chinese music. In the first evaluation, the vital signs and level of anxiety of the two groups were similar. There was significant reduction in the level of anxiety in the intervention group, compared with the control group (42.5 versus 46.4; p=0.005). Upon analyzing each group individually, it was observed that the control group patients had their diastolic blood pressure (74.0 versus 72.0; p=0.030), heart rate (74.1 versus 70.1; p<0.01) and respiratory frequency (17.6 versus 16.7; p<0.01) reduced from the first to the second evaluation. In the intervention group, there was a reduction in systolic blood pressure (127.7 versus 124.2; p<0.01), heart rate (74.3 versus 71.1; p<0.01), respiratory frequency (17.7 versus 16.6; p<0.01) and anxiety states (46.1 versus 42.5; p=0.040).

Continues

Aims / Jadad Scale	Intervention	Number of participants/ Mean age (years) and gender	Assessment tools/ Time points	Main results
To examine whether exposure to music therapy and psychoeducational training reduce objective and subjective anxiety, leading to a reduction in anxiolytic medication <sup>(15)</sup> . <b>Jadad Scale: 3</b>	<b>Intervention group (exposed to music therapy):</b> patients listened to a pre-selected song through earphones immediately after being placed on the catheterization table and until they left the room where the procedure was performed. <b>Intervention group (training group):</b> patients received music therapy the day before the cardiac catheterization and during the procedure. Psycho-educational training focused on cognitive behavior was performed for 50 minutes, in addition to which patients were given guidance concerning the procedure and some relaxation training and stress control through music therapy. Observation: music for both intervention groups was relaxing. <b>Control group:</b> patients received the prescribed medications but did not receive any verbal or nonverbal intervention.	<b>Total sample:</b> 83 <b>Intervention group (exposure to music therapy):</b> 28 <b>Mean age:</b> 65.8 <b>Gender:</b> 12 females <b>Intervention group (training group):</b> 28 <b>Mean age:</b> 66.2 <b>Gender:</b> 12 females <b>Control group:</b> 27 <b>Mean age:</b> 67.5 <b>Gender:</b> 12 females	<b>Instruments:</b> objective anxiety: State-Trait Anxiety Inventory; subjective anxiety: 10-point Visual Analog Scale; vital signs: instruments that assess vital signs. <b>Time points:</b> objective and subjective anxiety: before and after the procedure; heart rate and blood pressure: baseline, before arrival at the unit and after the procedure.	Music therapy was effective in reducing subjective anxiety (11.0 <i>versus</i> 4.0 <i>versus</i> 6.0; $p=0.033$ ) in both intervention groups when compared to the control group. The hypothesis that the training group would further reduce its anxiety levels in comparison with the other intervention group was rejected. Regarding the use of medications and the physiological variables, it was ascertained that there was no difference between the groups.
To investigate the effects of music on patients' anxiety, angina, pain, relaxation and comfort during angiographic procedures and to evaluate the differences between genders <sup>(16)</sup> . <b>Jadad Scale: 3</b>	<b>Intervention group:</b> calm and relaxing music, with different melodies and 60 to 80 beats per minute. Music was played from the moment the patient was placed on the catheterization table until he or she left the unit. The volume was controlled according to patient's preference and was not enough to disturb communication with the team. <b>Control group:</b> routine care for patients submitted to cardiac catheterization. Observation: both groups were divided by gender (male and female).	<b>Total sample:</b> 238 <b>Intervention group:</b> 121 <b>Mean age:</b> 67.0 <b>Gender:</b> 60 females <b>Control group:</b> 117 <b>Mean age:</b> 64.0 <b>Gender:</b> 59 females	<b>Instruments:</b> anxiety before the procedure, pain, discomfort from lying down, easy music: 0–10 Numerical Value Scale; anxiety after the procedure: State- Trait Anxiety Inventory – short version). <b>Time points:</b> anxiety and pain: before the procedure; pain, discomfort lying down, easy music and anxiety: after the procedure.	There were no differences between the control group and the intervention group for any of the outcomes evaluated: anxiety (2.0 <i>versus</i> 2.0; $p=0.479$ ), angina (0.0 <i>versus</i> 0.0; $p=0.741$ ), pain (3 <i>versus</i> 3; $p=0.487$ ), relaxation (8 <i>versus</i> 8; $p=0.218$ ), comfort (3 <i>versus</i> 2; $p=0.260$ ) and ambient sound (10 <i>versus</i> 10; $p=0.764$ ). The female group was more anxious in comparison with the male group (3 <i>versus</i> 1; $p=0.001$ ).

Continues



Box 1 (cont.)

Aims / Jadad Scale	Intervention	Number of participants/ Mean age (years) and gender	Assessment tools/ Time points	Main results
<p>To examine the effect of music on the levels of anxiety, stress and depression experienced by patients undergoing coronary angiography<sup>(17)</sup>. <b>Jadad Scale:</b> 3</p>	<p><b>Intervention group:</b> music therapy before and after the procedure. The music lasted for 20 minutes, containing parts of three distinct songs, with 70 to 80 beats per minute and with stable, slow rhythms. The patients remained seated in comfortable chairs and were advised neither to read, nor to watch television. <b>Control group:</b> participants were evaluated before and after the procedure and remained seated in comfortable chairs for 20 minutes, being advised neither to answer the telephone, listen to the radio nor watch television – although they were allowed to read books, newspapers and magazines.</p>	<p><b>Total sample:</b> 74 <b>Intervention group:</b> 37 <b>Mean age:</b> 50.6 <b>Gender:</b> 15 females <b>Control group:</b> 37 <b>Mean age:</b> 50.6 <b>Gender:</b> 22 females</p>	<p><b>Instruments:</b> anxiety: Depression, Anxiety and Stress Scale – DASS 21. <b>Time points:</b> anxiety: 1 hour and 30 minutes before the procedure, immediately after the music therapy in the intervention group, or after 20 minutes of rest in the control group; immediately after transfer to the unit and after the second intervention after the procedure.</p>	<p>Upon comparing the two groups, a statistically-significant difference was found for anxiety (0.71 <i>versus</i> 2.70; <math>p=0.006</math>), stress (2.30 <i>versus</i> 5.19; <math>p=0.001</math>) and depression (0.84 <i>versus</i> 2.19; 0.002). These variables, in the intervention group, had a significant reduction when compared to the control group.</p>
<p>To evaluate the effect of music on psychophysiological aspects of patients awaiting cardiac catheterization<sup>(18)</sup>. <b>Jadad Scale:</b> 1</p>	<p><b>Intervention group:</b> music therapy (sedative) for thirty minutes at rest and lying with the bed between 45 and 60°. The patients chose one of six songs (piano, harp, orchestra, jazz, Chinese orchestra, and synthesizer). Songs ranged from 60 to 80 beats per minute, the melodies were gentle and without dramatic changes in volume or rhythm. <b>Control group:</b> usual care at rest for the patients awaiting cardiac catheterization.</p>	<p><b>Total sample:</b> 54 <b>Intervention group:</b> 27 <b>Mean age:</b> the article did not provide this information <b>Gender:</b> the article did not provide this information <b>Control group:</b> 27 <b>Mean age:</b> the article did not provide this information <b>Gender:</b> the article did not provide this information</p>	<p><b>Instruments:</b> assessment of how the patient felt: 3-point Likert scale; anxiety: State-Trait Anxiety Inventory; heart rate, heart rate variability and ST segment: System BIOPA MP 150®; what they thought about the music: Visual Analogue Scale containing a 10 cm horizontal line in which 0 cm represents “didn’t like it” and 10 cm represents “liked it a lot”. <b>Time points:</b> assessment of how the patient felt: before intervention; state anxiety: baseline and after music therapy; physiological evaluations: six, with reviews every five minutes during the music in the intervention group or at rest in the control group; music preference: after the last assessment of physiological variables.</p>	<p>Anxiety was reduced in both groups between the first and second evaluations. This reduction, however, was statistically greater in the intervention group (9.41 <i>versus</i> 4.96; <math>p=0.003</math>). Regarding the physiological variables (heart rate and ST segment), although a reduction was obtained in their scores, no significant difference was observed between the groups. When each group was evaluated individually, however, significant differences were observed between the first and the second evaluation in both groups (<math>p&lt;0.001</math>). Regarding the variability of heart rate, there was no significant difference in any of the evaluations between the groups. Regarding musical preference, piano music was most commonly chosen. There was no correlation between musical preferences and alterations in the scores of physiological variables. However, there was a significant difference in musical preference and anxiety (<math>p=0.05</math>), indicating that the greater the patients’ satisfaction in choosing the music type, the lower their anxiety.</p>

Continues

Aims / Jadad Scale	Intervention	Number of participants/ Mean age (years) and gender	Assessment tools/ Time points	Main results
To assess the anxiolytic effects of different music styles in patients submitted to cardiac catheterization <sup>(19)</sup> . <b>Jadad Scale:</b> 2	<b>Intervention group:</b> patients who chose one of the following options during the procedure: classical music (35), modern relaxing music (42), jazz (23), no music (0). <b>Control group:</b> patients who were allocated, without choosing the type of music, in one of the following options, during the procedure: classical music (25), modern relaxing music (25), jazz (25), no music (25). <b>Observation:</b> all music had 60 to 80 beats per minute, a regular rhythm, and the volume was adjusted according to the permitted limit.	<b>Total sample:</b> 200 <b>Intervention group:</b> 100 <b>Mean age:</b> the article did not provide this information <b>Gender:</b> 27 females <b>Control group:</b> 100 <b>Mean age:</b> the article did not provide this information <b>Gender:</b> 36 females	<b>Instruments:</b> anxiety: State-Trait Anxiety Inventory; music perception: questionnaire on music perception, with scores ranging from 10 to 40 points; blood pressure and heart rate: questionnaire assessing vital signs. <b>Time points:</b> Trait anxiety: a day before the procedure; state anxiety: immediately before and immediately after the procedure; questionnaire on music perception: after the procedure; assessment of vital signs: 7 a.m.; five minutes before the procedure and five minutes after cardiac catheterization.	In the intervention group, modern relaxing music was the most effective for anxiety reduction compared to other music styles, and in the control group, classical music and jazz were the most effective. Patients who listened to a specific type of music had a statistically significant anxiety reduction when compared to the group that did not undergo this intervention (14.9 <i>versus</i> 6.2; $p < 0.0001$ ), and patients who did not choose the type of music had a significant reduction in anxiety levels when compared with the other group (16.8 <i>versus</i> 13.3; $p = 0.0176$ ).
To determine whether music therapy and sensory information are effective in reducing anxiety, uncertainty, heart rate and breathing, and whether it improves mood before cardiac catheterization <sup>(20)</sup> . <b>Jadad Scale:</b> 3	<b>Intervention group (music therapy):</b> music using only instrumental sounds before the procedure. <b>Intervention group (sensory information):</b> audio cassette containing sensory information, i.e., the possible sensations during the procedure related to sight, hearing, smell, taste and touch. <b>Control group:</b> routine nursing care related to the cardiac catheterization.	<b>Total sample:</b> 45 <b>Intervention group with music therapy:</b> 15 <b>Mean age:</b> 56.9 <b>Gender:</b> 3 females <b>Intervention group with sensory information:</b> 15 <b>Mean age:</b> 52.9 <b>Gender:</b> 2 females <b>Control group:</b> 15 <b>Mean age:</b> 65.0 <b>Gender:</b> 9 females	<b>Instruments:</b> anxiety: State-Trait Anxiety Inventory; mood: Profile of Mood States (POMS); uncertainty in illness: Mishel's Uncertainty in Illness Scale. <b>Time points:</b> anxiety, mood swings and uncertainty in illness: baseline, 1 hour before the procedure and 1 hour after cardiac catheterization.	None of the intervention groups (music therapy and sensory information) nor the control group significantly reduced anxiety (3.07 <i>versus</i> 0.07 <i>versus</i> 2.47), improved mood (0.07 <i>versus</i> 0.80 <i>versus</i> 3.53), or reduced uncertainty (2.07 <i>versus</i> 0.40 <i>versus</i> 1.20); furthermore, there was an increase in cardiac (1.42 <i>versus</i> 4.20 <i>versus</i> 2.0) and respiratory frequency (0.74 <i>versus</i> 0.20 <i>versus</i> 0.2).
To determine the effect of music on controlled psychophysiological stress response to cardiac catheterization <sup>(21)</sup> . <b>Jadad Scale:</b> 3	<b>Intervention group:</b> in addition to the same standard care received by the control group, patients listened to music before, during and after the procedure, using earphones. The music therapy started after patients had completed the questionnaires prior to the procedure, and they continued to listen to music (provided they wanted to) during and after the catheterization, before the second evaluation. <b>Control group:</b> standard care, including physical assessment before the procedure, and guidance about cardiac catheterization as well as about the routine administration of anxiolytic drugs and local anesthesia doing the procedure.	<b>Total sample:</b> 107 <b>Intervention group:</b> 56 <b>Mean age:</b> 59.0 <b>Gender:</b> 24 females <b>Control group:</b> 51 <b>Mean age:</b> 58.0 <b>Gender:</b> 25 females	<b>Instruments:</b> anxiety: State-Trait Anxiety Inventory; pain, fatigue and dyspnea: 10 cm Visual Analogue Scale; heart rate: external heart rate monitor; systolic and diastolic blood pressure: indirect blood pressure measurement. <b>Time points:</b> anxiety and pain: before and after the procedure and after removing the introducer; apical heart rate, systolic and diastolic blood pressure: baseline (before application of the questionnaire, prior to the start of the procedure), immediately before inserting the introducer, after the procedure and before removing the patient from the catheterization table, after the procedure (immediately before introducer removal).	There was no significant difference in the levels of anxiety and pain between the groups before (40.7 <i>versus</i> 39.0; $p = 0.28$ , and 0.3 <i>versus</i> 0.1; $p = 0.10$ , respectively) and after the procedures (33.6 <i>versus</i> 31.5; $p = 0.17$ , and 0.5 <i>versus</i> 0.4; $p = 0.23$ , respectively). Anxiety, however, was reduced after the procedure in both groups. Patients showed high levels of anxiety before the procedure, reduced to moderate levels after the catheterization. Thus, music therapy did not interfere in patients' levels of anxiety or pain. In relation to the physiological variables, there was an increase in heart rate and blood pressure during the procedure.

Continues

Box 1 (cont.)

Aims / Jadad Scale	Intervention	Number of participants/ Mean age (years) and gender	Assessment tools/ Time points	Main results
To measure the effectiveness of an educational video on reducing levels of uncertainty and anxiety for Chinese patients submitted to cardiac catheterization <sup>(13)</sup> . <b>Jadad Scale: 1</b>	<b>Intervention group:</b> educational video lasting 12 minutes, containing information on the cardiac catheterization, the feelings to be expected during the procedure and coping strategies. After the video, patients were asked if they had any doubts. In total, the intervention lasted approximately 20 minutes. In addition to the intervention through the video, patients received the same routine care as the control group. <b>Control group:</b> routine care for patients receiving cardiac catheterization, including a pamphlet about the procedure containing information on diet, preparation of the skin, the routine of hemodynamic observation and pain control.	<b>Total sample:</b> 128 <b>Intervention group:</b> 64 <b>Mean age:</b> 60.5 <b>Gender:</b> 20 females <b>Control group:</b> 64 <b>Mean age:</b> 62.11 <b>Gender:</b> 25 females	<b>Instruments:</b> anxiety: State-Trait Anxiety Inventory; uncertainty: Mishel's Uncertainty in Illness Scale; satisfaction level and perception of knowledge about the procedure: Visual Analogue Scale. <b>Time points:</b> anxiety and uncertainty: baseline (before video), 2 hours before the procedure and after the intervention; satisfaction and perception of knowledge about the procedure: from 20 to 24 hours after cardiac catheterization and before discharge of the patient.	The use of the educational video was effective in reducing levels of anxiety (4.9 versus 1.4; $p < 0.001$ ) and uncertainty (15.2 versus 2.7; $p < 0.001$ ) in patients who underwent cardiac catheterization. In addition, the educational video increased these patients' satisfaction and levels of knowledge in comparison with the control group.
To examine the effect of a psychoeducational nursing intervention in patients' anxiety early in the waiting period for elective cardiac catheterization <sup>(14)</sup> . <b>Jadad Scale: 3</b>	<b>Intervention group (nursing education):</b> nursing education one hour before cardiac catheterization, including a nursing visit, and presentation of written and visual material. <b>Control group:</b> these patients received the unit routine care for patients who undergo cardiac catheterization.	<b>Total sample:</b> 228 <b>Control group:</b> 114 <b>Mean age:</b> 62.9 <b>Gender:</b> 49 females <b>Intervention group:</b> 114 <b>Mean age:</b> 64.7 <b>Gender:</b> 41 females	<b>Instruments:</b> anxiety: State-Trait Anxiety Inventory and 0-10 Verbal Scale; quality of life: SF36; disease self-management functional status: SAQ. <b>Time points:</b> baseline (two weeks before the cardiac catheterization); pre-cardiac catheterization (after the educational intervention).	Anxiety increased in both groups over the waiting time (1.3 versus 1.6; $p = 0.028$ ). Anxiety was significantly higher in the control group (4.0 versus 5.2; $p = 0.002$ ). Regarding quality of life and disease self-management functional status, in the first evaluation there was no significant difference between the groups. However, a difference in quality of life (0.4 versus 3.2; $p = 0.06$ ) was observed when the first and second assessments were compared.
To investigate, in two studies, if palm therapy is effective in reducing anxiety in patients submitted to cardiac catheterization <sup>(23)</sup> . <b>Jadad Scale: 4</b>	<b>First study:</b> <b>Intervention group:</b> palm therapy for 45 minutes and conversation between the patient and the therapist during the session. <b>Control group:</b> pressure on the palms of their hands in places that have no effect. <b>Second study:</b> <b>Intervention group:</b> palm therapy for 45 minutes and conversation between the patient and a second person during the session. <b>Control group:</b> pressure on the palms of the hands in places that have no effect.	<b>First study:</b> <b>Total sample:</b> 23  <b>Control group:</b> 9 <b>Mean age and gender:</b> the article did not provide this information <b>Intervention group:</b> 14 <b>Mean age and gender:</b> the article did not provide this information  <b>Second study:</b> <b>Total sample:</b> 17 <b>Control group:</b> 10 <b>Mean age and gender:</b> the article did not provide this information <b>Intervention group:</b> 7 <b>Mean age and gender:</b> the article did not provide this information	<b>Instruments:</b> patients' self-report of anxiety; patients' and nurses' perception about patients' anxiety: Visual Analogue Scale. <b>Time points:</b> before and after treatment.	<b>First study:</b> Patients of both groups had similar levels of anxiety before the intervention. After the intervention, anxiety was lower in the patients who had received palm therapy, both in relation to self-reported anxiety (7.1 versus 40.1; $p = 0.0001$ ) and according to the nurses' perception of their anxiety (4.6 versus 12.6; $p = 0.0001$ ).  <b>Second study:</b> Patients of the intervention group had significantly lower anxiety in comparison with the control group, but only regarding self-reported anxiety (11.8 versus 30.0; $p = 0.005$ ).

Continues



Aims / Jadad Scale	Intervention	Number of participants/ Mean age (years) and gender	Assessment tools/ Time points	Main results
To evaluate the efficacy of a 20-minute massage in the reduction in patient levels of pain, anxiety and stress before an invasive cardiovascular procedure; to assess patient satisfaction with the massage; to assess the feasibility of therapeutic massage practices before the procedure <sup>(22)</sup> . <b>Jadad Scale: 4</b>	<b>Intervention group:</b> therapeutic massage for 20 minutes. The patients chose the area (head, nape, shoulders, arms, hands, back, legs and feet) and the strength used in the massage. <b>Control group:</b> 20 minutes of standardized care, lying on the bed or sitting in the chair, relaxing, reading a book, or conversing with family members or with the nursing team.	<b>Total sample:</b> 130 <b>Intervention group:</b> 64 <b>Mean age:</b> 67.2 <b>Gender:</b> 22 females <b>Control group:</b> 66 <b>Mean age:</b> 59.7 <b>Gender:</b> 22 females	<b>Instruments:</b> anxiety, pain, muscle tension and satisfaction: 10-point Visual Analogue Scale. <b>Time points:</b> anxiety, pain, muscle tension and satisfaction: in the morning (immediately before the therapeutic massage), 2 to 5 minutes after the intervention.	In the intervention group, pain (-1 <i>versus</i> -0.1; $p < 0.001$ ), muscle tension (-2.1 <i>versus</i> -0.3; $p < 0.001$ ) and anxiety (-2.1 <i>versus</i> 0.0; $p < 0.001$ ) were reduced more effectively and their levels of satisfaction were greater ( $p = 0.002$ ).

The following non-pharmacological strategies were utilized to reduce the anxiety of patients undergoing cardiac catheterization: music therapy ( $n = 8$ ; 66.7%)<sup>(12,15-21)</sup>, educational videos ( $n = 2$ ; 16.7%)<sup>(13-14)</sup>, massage ( $n = 1$ ; 8.3%)<sup>(22)</sup>, palm therapy ( $n = 1$ ; 8.3%)<sup>(23)</sup> and psychoeducational training ( $n = 1$ ; 8.3%)<sup>(15)</sup>. One study<sup>(15)</sup> used two interventions (music therapy and psychoeducational training); however, music was its main intervention. Music therapy was shown to be effective in most of the studies, with  $p$ -values ranging from  $< 0.001$  to 0.033, as shown in Box 1<sup>(12,15,17-18)</sup>. Several studies showed that music therapy reduced anxiety<sup>(12,15,17-19)</sup>, stress, depression<sup>(17)</sup> and physiological markers of anxiety, such as systolic blood pressure, heart rate and respiratory frequency<sup>(13)</sup>, with statistically significant differences in comparison with control groups, as shown in Box 1. Regarding the moment when the intervention was carried out, some studies performed the interventions before catheterization<sup>(12,18,20)</sup>, others during the procedure<sup>(15,18-19)</sup>, another before and after the hemodynamic procedure<sup>(17)</sup> and another before, during and after the cardiac catheterization<sup>(21)</sup>. However, no study identified whether before or during the procedure was the most effective for the intervention.

Patients did not choose their preferred music in most of the studies<sup>(15-17,20-21)</sup>. One study demonstrated that patients who did not get to choose the type of music had a significant reduction in anxiety compared to patients able to choose their preferred music ( $p = 0.0176$ )<sup>(19)</sup>. Generally, the music was relaxing (60 to 80 beats per minute) with no drastic volume or rhythm changes.

In addition to music therapy, other strategies were identified to reduce anxiety in patients undergoing to cardiac catheterization, although there were very few of these. Other interventions discussed in this review include: educational videos, massage, and palm therapy.

Two studies showed that educational videos were effective in reducing anxiety in patients who underwent cardiac catheterization<sup>(13-14)</sup>. This strategy was effective because the videos contained information about the procedure and discussed and anticipated feelings that may arise during the procedure.

It was observed that the strategy of administering a massage for 20 minutes was also effective for anxiety reduction in these patients<sup>(22)</sup>. A study by Blaer et al.<sup>(23)</sup> showed that anxiety levels were reduced in the group that received palm therapy for 45 minutes. Palm therapy is a moderate continuous pressure on specific points of the palm that are supposed to represent specific areas of the brain and may be effective for reducing some signs and symptoms presented by patients<sup>(23)</sup>.

## DISCUSSION

There is very little evidence in the literature about the effectiveness of non-pharmacological strategies for anxiety reduction in patients undergoing cardiac catheterization. In the majority of the studies identified in this review, non-pharmacological interventions were effective, music therapy being the most commonly used.

Music can help eliminate pain and reduce stress and tension, besides inducing relaxation<sup>(24)</sup>. Music is an ideal non-pharmacological intervention in that it is easily accessible, inexpensive and favors anxiety reduction and physiological activity<sup>(25)</sup>.

Among the studies that used music therapy as an intervention to reduce anxiety and let subjects choose their preferred music, it was observed that the most common music style chosen was classical music. However, from our review, it appeared that choosing the music did not influence patients' level of anxiety. One explanation may be that patients frequently expressed doubt in their decision and worried that health professionals may not like their choice<sup>(19)</sup>, subsequently increasing anxiety levels.

In spite of music being the intervention most frequently used as a strategy for anxiety reduction in patients undergoing cardiac catheterization, there was no consensus about the best type of music, or the best time for listening to it. This consensus may not be established due to the heterogeneity of methods used in the reviewed studies. In this context, future studies should be conducted with consistent methodology.

Although the other strategies identified in this review (educational video, massage and palm therapy) have shown positive results in reducing anxiety in patients undergoing cardiac catheterization, there are few publications to highlight their clinical benefits. For this reason, further studies are needed to validate these findings.

The use of educational sessions before admission, such as instructions about the procedure through videos, showed effective improvements in the knowledge of hospital procedures and a reduction in patients' anxiety<sup>(26)</sup>. Studies show that patients become calmer when they have the opportunity to know more about the upcoming procedure; nurses can mitigate patient anxiety by offering systematized information about the procedure to the patient<sup>(13-14)</sup>. However, a few studies were performed with the aim of identifying the effectiveness of educational videos to reduce the level of anxiety of patients undergoing cardiac catheterization.

In relation to the study on massage, it was observed that it promotes relaxation, and reduces stress and anxiety<sup>(27)</sup>. The study that used palm therapy was based on the theory that the palm of the hand represents the entire body in miniature and that certain points correspond to specific areas of the brain, both motor and sensory. Hence, moderate continuous pressure on specific points of the palm of the hand can reduce anxiety effectively<sup>(23)</sup>. Studies show that alternative therapies are increasingly being used to reduce patients' anxiety<sup>(28-29)</sup>, and these interventions must be considered by health professionals when dealing with anxious patients.

It is worth emphasizing the methodological quality of the reviewed studies. The majority of studies were considered of good quality. The studies classified as poor did not describe how the authors performed the randomization<sup>(18-19)</sup>, did not explain the account of all patients<sup>(12,18)</sup> or did not randomize the patients<sup>(12-13)</sup>. The majority of the articles reviewed did not describe the study settings and did not control some aspects that could have changed patients' anxiety, such as the light color<sup>(30)</sup>. Another result that should be emphasized is that, although most of the studies were clinical trials, sample sizes were small, ranging from 17 to 238 participants; some studies did not calculate sample size. Others studies are needed to validate these results. Another limitation is that we did not include all relevant studies due to the exclusion criteria "full text not available".

## CONCLUSION

This review identified strategies used to reduce anxiety in patients submitted to cardiac catheterization, including music therapy, palm therapy, educational videos and massage. These studies suggested that anxiety can be reduced through these four strategies and may be administered by nursing staff. It is known that reducing anxiety can decrease heart rate and blood pressure, thereby reducing oxygen consumption, which may be beneficial for the patient's prognosis. However, because this is an integrative literature review, we did not perform a meta-analysis and future systematic literature reviews should be performed in order to identify the effectiveness of these strategies.

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