Applied Nursing Research 72 (2023) 151687

Contents lists available at ScienceDirect

Applied Nursing Research

journal homepage: www.elsevier.com/locate/apnr

The effect of self-affirmation on anxiety and perceived discomfort in patients who have undergone open-heart surgery. A randomized controlled trial☆

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ARTICLE INFO

Keywords:
Anxiety
Discomfort
Open-heart surgery
Self-affirmation
Randomized controlled trial

ABSTRACT

Background: Self-affirmations help one focus on positive outcomes and adapt to new situations both psychologically and physiologically by the repetition of positive affirmation sentences. This method, which has promising results in symptom management, is predicted to have effective results in the management of pain and discomfort in patients undergoing open-heart surgery.
Aim: To investigate the effect of self-affirmation on anxiety and perceived discomfort in patients who have undergone open-heart surgery.
Methods: This study adopted a randomized controlled pretest-posttest follow-up research design. The study was conducted at a public training and research hospital (Istanbul, Turkey) specialized in thoracic and cardiovascular surgery. The sample consisted of 61 patients randomized into two groups: intervention ($n = 34$) and control ($n = 27$). The participants of the intervention group listened to a self-affirmation audio recording for three days after surgery. Anxiety levels and perceived discomfort regarding pain, dyspnoea, palpitations, fatigue and nausea were measured daily. The State Trait Anxiety Inventory (STAI) was used to measure the level of anxiety, meanwhile perceived discomfort regarding pain, dyspnoea, palpitations, fatigue and nausea were measured by a 0 to 10 Numeric Rating Scale (NRS).
Results: The control group had significantly higher anxiety than the intervention group three days after surgery ($P < 0.001$). The intervention group had less pain ($P < 0.01$), dyspnoea ($P < 0.01$), palpitations ($P < 0.01$), fatigue ($P < 0.001$) and nausea ($P < 0.01$) than the control group.
Conclusions: Positive self-affirmation helped reduce anxiety and perceived discomfort in patients who underwent open-heart surgery.
ClinicalTrials.gov Identifier: NCT05487430.

1. Introduction

Anxiety is critical in postoperative patient care due to the fact that it is associated with increased morbidity, complications and reduced quality of life. It also causes depression, which results in increased morbidity and mortality in the long term. Anxiety is quite common in patients who undergo open-heart surgery which is a complex procedure that requires intensive postoperative care (Hernández-Palazón et al., 2018; Williams et al., 2013). Additionally, the use of non-biological materials such as synthetic grafts, valves may increase the fear of

☆ The short abstract of this study was presented as an oral presentation in the 4th International 12th National Congress of Turkish Surgical and Operating Room Nurses between January 13th and 16th in Antalya, Turkey.

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https://doi.org/10.1016/j.apnr.2023.151687
Received 17 August 2022; Received in revised form 15 February 2023; Accepted 6 May 2023
Available online 17 May 2023

death and loss of functionality. The main causes of heart surgery-related anxiety can be listed as the surgery itself, the fear of uncertainty, death, anaesthesia, pain, limited social and/or sex life, and impotence due to loss of physical health, as well as financial and aesthetic concerns (Bang & Park, 2020; Hernández-Palazón et al., 2018).

Following an open-heart surgery, pain is one of the most frequent physical complaint that can be the triggering factor of some other symptoms such as dyspnoea (Sasseron et al., 2009) and fatigue (Christensen & Kehlet, 1993). Respiratory dynamics are changing when the patient is suffering pain and uncontrolled pain has a positive correlation with the worsening of lung functions (Sasseron et al., 2009). As a results of this the patient experience a certain level of dyspnoea which acts like a chaining factor that provokes a state of anxiety, but this can also work the other way around where increased anxiety can worsen the level of dyspnoea, and as a results the patients may find themselves in the cycle of dyspnoea-anxiety-dyspnoea (Bailey, 2004). Additionally, it was reported that preoperative anxiety can be associated with postoperative complications, among them nausea (Rodrigues et al., 2018). Besides, nausea and vomiting after cardiac surgery is often associated with postoperative pain, and anxiety as well (Sawatzky et al., 2014). On the other hand; fatigue, which can be encountered as one of the secondary complaints during postoperative period, is strongly related to altered level of mobilization (Christensen & Kehlet, 1993) and poor sleep quality (Kehlet & Dahl, 2003) due to postoperative pain. All these symptoms, which are closely related to each other, negatively affect the recovery process of the patient after open-heart surgery. Therefore, it is highly important to include non-pharmacological methods in the recovery plan in addition to pharmacological treatment. Literature findings demonstrate promising results regarding the role of optimism after open-heart surgery (Arsyi et al., 2022; Scheier et al., 1999). In this context, considering the effect of positive thinking, how positive self-affirmations would affect symptom management after open-heart surgery emerges as an important research question.

The self-affirmation theory posits that one tends to protect one's self with the motivation to experience positive emotions while facing situations that are threatening to one's self-concept (Sherman, 2013; Sherman & Cohen, 2006; Steele, 1988). Health problems and challenging treatments may cause symptoms that are threatening to patients' self-image and this threat adversely affects their psychological immune system. Individuals use different strategies to rationalize their experiences and adapt to adverse situations. Self-affirmation helps one focus on positive outcomes and adapt to new situations both psychologically and physiologically by the repetition of positive affirmation sentences (Sherman & Cohen, 2006). On the other hand, it is beneficial to cope with daily stressors as well. Research studies that focused on the benefits of self-affirmation show an association between self-affirmation and changes in stress-related physiological parameters (Creswell et al., 2007; Sherman, 2013; Yildirim et al., 2017). It was thought that there is a significant need to use positive self-affirmation in the postoperative care of open-heart surgery where anxiety is difficult to manage but also necessary. Considering the fact that no study in the literature explored the use of self-affirmation in this specific area, the present study aimed to investigate the effect of self-affirmation on anxiety and perceived discomfort in patients who underwent open cardiac surgery.

2. Methods

2.1. Study design

This study adopted a randomized controlled pretest-posttest follow-up research design in accordance with CONSORT guidelines (Moher et al., 2010) with 2 study groups (intervention and control).

2.2. Research question and hypothesis

The study initiated with the research question of *How do self-affirmation affect postoperative anxiety and perceived discomfort (regarding pain, dyspnoea, palpitations, fatigue and nausea) in patients who undergo open-heart surgery?* In accordance with this question, the hypotheses were that repetitive positive self-affirmations decrease both anxiety and perceived discomfort in patients who underwent open-heart surgery.

2.3. Study setting and participants

The study was conducted among the patients who underwent open-heart surgery in the in-patient clinics of a public hospital (Istanbul, Turkey). Following the surgical intervention, all patients were admitted to the cardiac intensive care unit (CICU) for close postoperative follow-up. According to the hospital protocol, the minimum duration for a CICU stay is 2 days after surgery in patients that are hemodynamically stabilized. On their 3rd postoperative day, they are discharged from CICU to be admitted to the in-patient clinic and; in this study, their first day in the clinic was considered as the adaptation and resting period, so that the sampling process was started on the 4th postoperative day.

The patients were evaluated for their eligibility according to the following inclusion criteria: undergoing coronary artery bypass surgery (CABS) for the first time, not having any history of a previous open cardiothoracic surgery, being over 18 years, and being literate in Turkish. The exclusion criteria were having a diagnosed anxiety disorder and/or hearing deficiency, having an emergency CABS, and staying in the CICU for >48-hours. Eighty-five patients were assessed for eligibility. Five patients excluded from the study before randomization. Following the randomization, 12 patients were excluded during the initial allocation and then 7 more patients were excluded during the follow-up. The final study sample consisted of 61 patients who underwent CABS; 34 in the intervention group and 27 in the control group. The CONSORT Flow Diagram shows the recruitment process (Fig. 1).

2.4. Study intervention

Each participant of the intervention group was given a set of earphones and an MP3 player which included an audio recording with a background sound of birds crowing and river-like flowing water together with the positive affirmation sentences that are presented in Table 1. The self-affirmation sentences were created by the first author, who is a certified Emotional Freedom Technique and second degree Reiki practitioner, by paying special attention to not using negative predicates and words with negative meanings such as pain, nausea, and discomfort, so that a positive expectancy and excitement can be assured (Leon, 2006). In the audio recording, the affirmative sentences were verbalized by the first author with a soothing voice. Between each sentence, a pause was given so that the patient could repeat each sentence verbally or internally. The audio recording lasted 5 min 40 s and the patients were asked to listen to it at least once a day, however, they were encouraged to listen to it as much as they wanted. The participants of the control group only received the conventional care given in the inpatient clinic.

For sternotomy pain, patients in both study groups received 1 g of Paracetamol 3 times a day throughout the data collection period. The symptoms such as dyspnoea, palpitations and nausea can both be related to anxiety and physiological causes; and the threshold of asking for medication for managing these symptoms may vary from patient to patient. In fact, it is important to mention that none of the patients of this study asked for medication for alleviating their nausea, dyspnoea, and palpitations during the data collection process.

2.5. Outcome measures

The primary outcome of the study was the level of state anxiety during the postoperative stay in the in-patient clinic. The State Trait Anxiety Inventory (STAI) was used to measure the level of anxiety. It is a

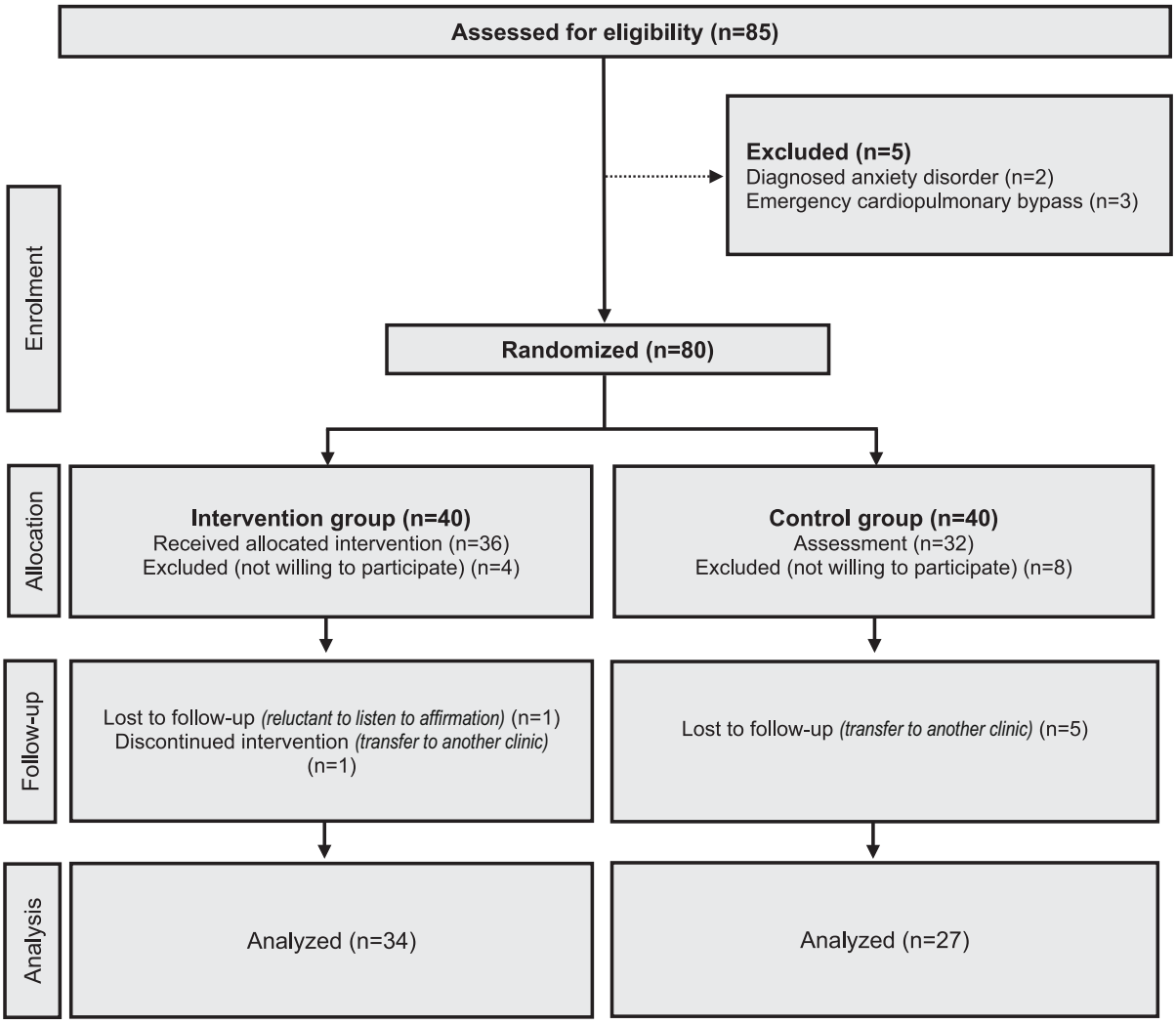

Fig. 1. CONSORT flow diagram.

40 item, 4-point Likert scale ranging from 1 *(not at all)* to 4 *(very much so)* and consisting of two sub-dimensions; state anxiety and trait anxiety, 20 items each. The scale was developed by Spielberger et al. in 1970 (Spielberger et al., 1970) and adapted to Turkish by Öner and LeCompte in 1983. In this validated Turkish version, the Cronbach's alpha internal consistency level was found between 0.83 and 0.92 for the trait anxiety subscale, which is considered very reliable (Öner & LeCompte, 1983). The total score ranges from 20 to 80 where higher scores indicate higher levels of anxiety. For the subsequent measurements of anxiety, only the state dimension of the STAI was used.

As the secondary outcome measures of the study, patients' level of perceived discomfort regarding pain, dyspnoea, palpitations, fatigue, nausea were measured by a Numeric Rating Scale (NRS) of 0 to 10 where higher scores indicate more discomfort. Numeric Rating Scale is mainly used to evaluate perceived level of pain and it can be regarded as a reliable tool with an interclass correlation coefficient (CI) of 0.95 (Alghadir et al., 2018). Its validity in measuring dyspnoea (r = 0.80–0.82) (Gift & Narsavage, 1998), fatigue (CI = 0.82) (Gladman et al., 2020), nausea (r = 0.79) (Wikström et al., 2019), and certain arrythmia related symptoms (α = 0.81) (Härdén et al., 2009) was also demonstrated.

2.6. Randomization and data collection

Randomization involved 80 eligible patients detected by the third author according to inclusion criteria. Initially, the researchers generated a random number list in Microsoft Office Excel®, simulating a coin toss where they defined the intervention and control groups as 1 and 0, respectively. Then, they randomly assigned the patients to either of these groups. Only the researchers had the access to the final list demonstrating the participants of each group, however, blinding the intervention group from the clinical staff was not possible due to the fact that the patients were listening to the affirmation recordings. The cross-over between the study participants were avoided by having one participant at a time in each patient room, and the participants of the intervention group were asked to listen to the recording only when they are in their room so that they don't coincide with other patients in the hallway while listening to the recording.

Data were collected by using a questionnaire for registering demographic and health-related data, state sub-dimension of the STAI, and 0 to 10 numeric scales to measure the level of discomfort. Additionally, with the help of relatives and with the supervision of the researchers the patients wrote down when and how many times they listened to the audio recording. The role of the relatives and the researchers was only to check if the patient has listened the recording at least once a day, and registered regularly his/her listening pattern. This also facilitated avoiding missing data in the study.

The baseline data (pre-test) was obtained on the fourth postoperative day considering the fact that the patients were comfortably adapted to the in-patient clinic and were more open to collaborate in the study.

Table 1
Self-affirmations used in the audio recording.

1. Now I have decided to think more positively.
2. I am in control of my thoughts.
3. I am completely relaxed.
4. I am strong, and I am aware of my strength.
5. I can be comfortable and positive in any situation.
6. I love myself as I am and accept myself for who I am.
7. I know very well how to relax.
8. All my muscles relax with every deep breath I take.
9. I leave myself in peace.
10. I am a relaxed, joyful, and happy person.
11. I am calm at all times and in all situations.
12. I know that everything that happens in my life happens for my own good.
13. I am very good at relaxing.
14. My life energy is rising.
15. I am surrounded by positive energy.
16. I spend my days with joy.
17. I know that I am always safe.
18. I have high life energy.
19. I think positive thoughts
20. I am healthy, strong, and safe
21. My life energy is increasing day by day.
22. I am thankful for being healthy.
23. My body is getting stronger and healthier every day.
24. My body is renewing itself rapidly.
25. It is very easy for me to relax my body.
26. I am filled with healing energy with every deep breath I take.
27. I make choices that improve my health.
28. I relax all my body, and I like being relaxed.
29. I am thankful for being healthy, and I feel good.
30. I am totally safe.
31. I lead my life as a healthy person.
32. I think positive thoughts, and it makes me feel good.
33. I have a very strong body.
34. My body is always renewed by the power of love.
35. I choose to be healthy and to protect my health.
36. I choose to be at peace.
37. Every breath I take relaxes all my muscles.
38. I relax more and more with every breath I take.
39. My body knows very well how to relax.
40. I feel much better with each passing second.

Additionally, preoperative anxiety weren't considered as a baseline evaluation because it is known that during the preoperative period the sources of anxiety are mainly related to uncertainties and fear of death (Budak Ertürk & Ünlü, 2018; Feuchtinger et al., 2014; Robley et al., 2010). However during the postoperative period the patients are more likely to be concerned about their need to be protected, in other words, their vulnerability and fragility (Karlsson et al., 2005, 2010; Lapum et al., 2011).

Each patient was followed up for 3 days. The data collection process lasted 4 months, between the 20th of November of 2019 and the 20th of March of 2020. The primary objective was to reach 255 patients in total in accordance with the sample size calculation, knowing that in the previous year 7745 surgeries were done in the hospital, and among them 1700 were CABSs. However, due to the emerging situation that appeared with COVID-19 pandemic the data collection process was interrupted. Using the data collected up to that time, a power analyses was conducted with G*Power and indicated that the current data present high power (1 - $\beta = 0.93$) with the effect size of $d = 0.91$ ($\alpha = 0{,}05$), therefore re-recruitment was not needed and the study was considered as completed. The details of the data collection process and mean numbers of repetitions of the audio recording were demonstrated in Fig. 2.

2.7. Statistical analysis

In this study, intention-to-treat analysis was not used as all the participants were asked to listen to the self-affirmation recording at least once a day, because daily repetition is the key element when affirming positive sentences in order to mobilize the inner sources of the individual (Chandler et al., 1992; Leon, 2006, pp. 81–82; Sherman & Cohen, 2006). Therefore, only per-protocol analysis where all participants strictly adhered to the study protocol was conducted (Tripepi et al., 2020).

The data were analysed by using the Statistical Package for the Social Sciences (IBM, SPSS, 21.0) at a significance level of 0.05. In the descriptive analysis, mean was used for the numerical data, and frequency for the categorical data. The homogeneity between the study groups regarding the participants' descriptive characteristics was tested with the Chi-Square test. Repeated measures analysis of variance (ANOVA) was used to identify the differences between the study groups, meanwhile within-group comparisons were done by the Independent Sample *t*-Test.

2.8. Ethical considerations

The study abided by the Declaration of Helsinki (Association, 2001) and was approved on July 30th, 2019 by the Non-Interventional Ethical Committee of the hospital where the study was conducted with the registration number 2019-52. The voluntary patients were asked to sign the informed consent form and one signed copy was given to each patient.

3. Results

The sample consisted of 61 patients divided into intervention ($n = 34$) and control ($n = 27$) groups, which were homogeneous regarding their descriptive characteristics (Table 2).

The experimental group had higher anxiety levels than the control group when they were admitted to the clinic from the CICU (Baseline, day one) ($P < 0.05$). Both groups had the same level of state anxiety on their 2nd day in the clinic ($P > 0.05$). However, the control group had significantly higher state anxiety than the experimental group on the 3rd day ($P < 0.01$). Overall, the experimental group had significantly lower anxiety levels than the control group on those three consecutive days ($P < 0.001$) Regarding the anxiety scores at the baseline, the study groups were not equally likely before the intervention, therefore it was needed to filter out the baseline data as a covariate during the post-test (Days 2 and 3) analysis by conducting an analysis of covariances (ANCOVA). Following this adjustment, it was seen that the state anxiety scores of the experimental group were even slightly less on both post-test measurements, while the control group's adjusted means showed a slight increase (Table 3).

Participants were asked to rate the severity of the pain they had been experiencing for three days since they were admitted to the inpatient clinic. The experimental group had significantly less pain than the control group ($P < 0.01$) (Table 4).

There were far more control participants who experienced dyspnoea than we expected. On the other hand, none of the participants in the intervention group suffered from severe dyspnoea ($P < 0.01$). The number of experimental participants who had palpitations was significantly lower than that of control participants who had palpitations ($P < 0.01$). Seven out of every ten control participant (70.4 %) reported severe fatigue, whereas only one participant of the intervention group (2.9 %) reported severe fatigue ($P < 0.001$). The intervention group experienced mild nausea significantly less than the control group ($P < 0.01$) (Table 5).

4. Discussion

This randomized controlled experimental study, as a first time in literature, provides findings that point out the efficacy of self-affirmation on the management of postoperative anxiety and perceived discomfort following open-heart surgery. It was shown that anxiety and perceived discomfort regarding pain, dyspnoea, palpitations, fatigue, and nausea were less common in patients who listened to

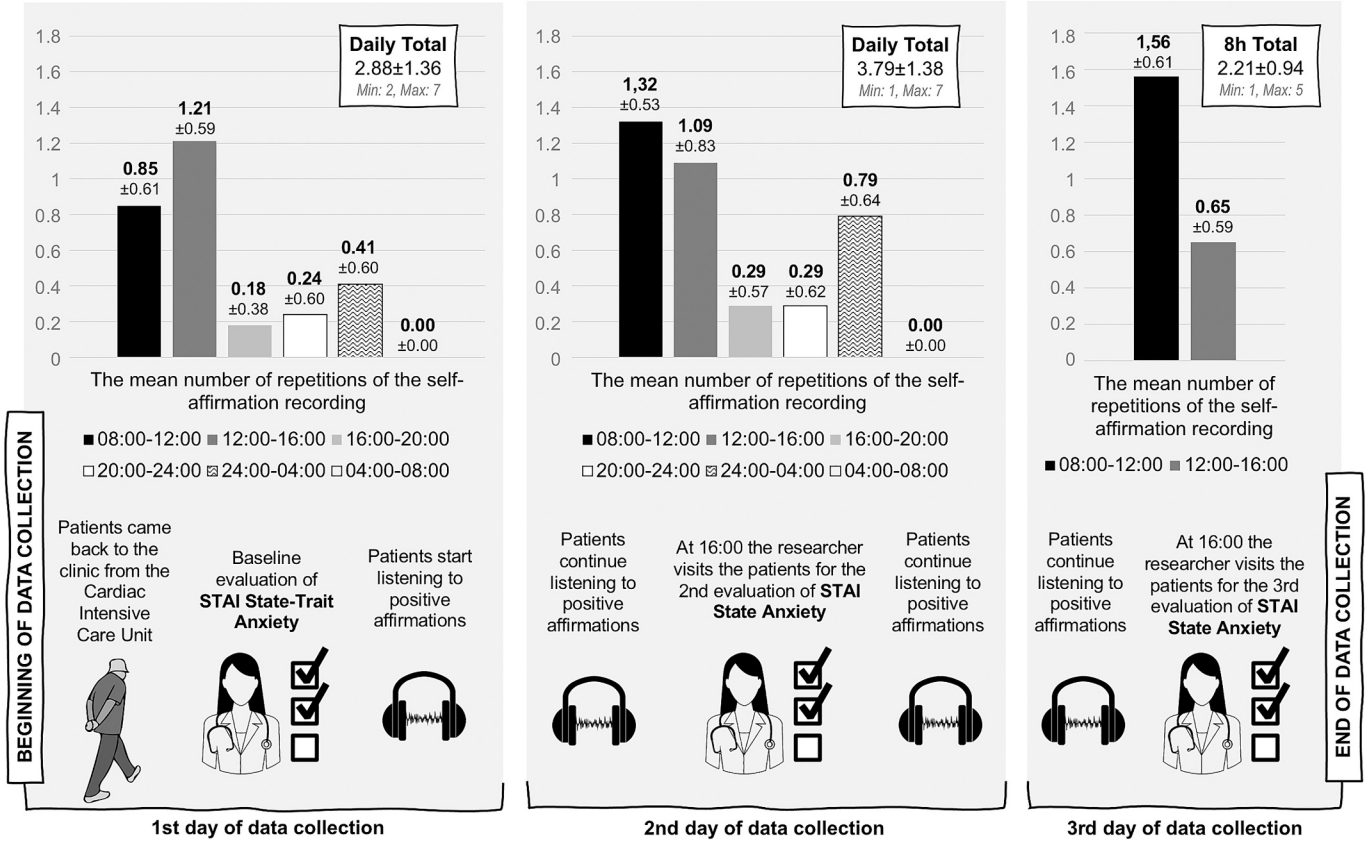

Fig. 2. Self-affirmation listening patterns and data collection process.

self-affirmation than those who did not. Anxiety is a common problem in patients who undergo cardiac surgery both before and after the surgical intervention. Additionally, it is an important risk factor for morbidity (Miozzo et al., 2016; Tully et al., 2011) and it may also affect negatively the physical and psychological recovery during the postoperative period. Various non-pharmacological methods such as massage, acupressure, music, progressive muscle relaxation exercises are used to reduce anxiety following open-heart surgery (Aygin & Şen, 2019; Heidari et al., 2015; İbrahimoğlu & Kanan, 2017; Miozzo et al., 2016; Voss et al., 2004). This study is the first to show experimentally that the use of self-affirmation can also be considered as a non-pharmacological method in the management of anxiety in patients who underwent open-heart surgery. The results showed that the patients who listened to self-affirmation had significantly lower anxiety levels than those who did not. According to self-affirmation theory, when the individual treats the self as competent, good, and effective; in other words, when the individual's valued sources are affirmed, the negative impacts of a situation that threatens the self (such as a complex surgery) decrease. Additionally, the individual's physiological and psychological well-being is positively affected (Sherman et al., 2009; Shifeng et al., 2020). There is a large body of research pointing to the positive effects of self-affirmation. It was reported that people who had affirmation sessions had lower cortisol and cardiovascular responses in stressful situations than those who did not (Morgan & Harris, 2015). It was also confirmed that self-affirmation in writing reduces stress responses and clinical symptoms in patients with early breast cancer (Creswell et al., 2007). Different than the present study design, the studies that explored the efficacy of self-affirmation commonly used writing as an inculcation method (Chen et al., 2021; Creswell et al., 2007; Harris et al., 2007; Morgan & Harris, 2015). In another study, auditory self-affirmation were used for the symptom management in chemotherapy patients and it was found that anxiety levels were decreased significantly in the groups who listened to self-affirmation with and without the additional background music based on nature sounds (Yildirim et al., 2017). It can be said that self-affirmation can be repeated by writing and/or by listening, however, considering that postoperative patients often have severe fatigue during their early recovery process, the usage of auditory self-affirmation can be an easy-to-use relaxation method in order to relieve their anxiety.

In addition to anxiety, the intensity of perceived pain was also investigated in the present study. Patients undergoing open-heart surgery experience pain due to sternotomy, which causes discomfort despite the pharmacological agents available to manage it (Huang & Sakata, 2016). In this study, it was found that the patients who listened to self-affirmation have significantly less pain than the patients in the control group. In one study, expressive writing was used as a self-affirmation technique in fibromyalgia patients and reported decreased pain levels (Broderick et al., 2005). Another study used written emotional disclosure in chronic pelvic pain patients and obtained lower evaluations of pain intensity (Norman et al., 2004). In the study of Yildirim et al. chemotherapy patients' pain levels were decreased after listening to the self-affirmation recording with and without additional nature sounds (Yildirim et al., 2017). The present study is the first to explore the effect of self-affirmation on pain following open-heart surgery. However, the relaxing effect of nature sounds on pain after cardiac surgery was studied by Cutshall et al. and it was reported that the patients undergoing cardiac surgery reported a significant decrease in pain in addition to being more relaxed and less anxious (Cutshall et al., 2011). Therefore, it can be said that combining self-affirmation with nature sounds had a synergetic positive effect on pain relief after open-heart surgery.

Dyspnoea is common following cardiac surgery due to decreased postoperative respiratory muscle strength (Johnson et al., 1996). Additionally, the existence of postoperative anxiety can intensify the

Table 2
Descriptive characteristics and test of homogeneity.

Variable	Experimental group ($n = 34$)	Control group ($n = 27$)	Total sample ($n = 61$)	Test of homogeneity
	n (%)	n (%)	n (%)	
Gender				
Female	2 (5.9)	5 (18.5)	7 (11.5)	$X^2 = 2.365$[a] $p = 0.224$
Male	32 (94.1)	22 (81.5)	54 (88.5)	
Marital status				
Single	2 (5.9)	1(3.7)	3 (4.9)	$X^2 = 0.153$[a] $p = 1.000$
Married	32 (94.1)	26 (96.3)	58 (95.1)	
Education (degree)				
Literate	1 (2.9)	4 (14.8)	5 (8.2)	
Elementary school	19 (55.9)	11 (40.8)	30 (49.2)	$X^2 = 4.068$[a] $p = 0.272$
Middle school	7 (20.6)	8 (29.6)	15 (24.6)	
High school	7 (20.6)	4 (14.8)	11 (18.0)	
Employment status				
Employed	7 (20.6)	4 (14.8)	11 (18.0)	$X^2 = 0.339$[a] $p = 0.740$
Unemployed	27 (79.4)	23 (85.2)	50 (82.0)	
Perceived income				
Low	2 (5.9)	5 (18.5)	7 (11.5)	$X^2 = 2.405$[a] $p = 0.349$
Moderate	27 (79.4)	19 (70.4)	46 (75.4)	
High	5 (14.7)	3 (11.1)	8 (13.1)	
Chronic disease				
Yes	19 (55.9)	18 (66.7)	37 (60.7)	$X^2 = 0.733$ $p = 0.392$
No	15 (44.1)	9 (33.3)	24 (39.3)	
History of surgery				
Yes	16 (47.1)	13 (48.1)	29 (47.5)	$X^2 = 0.007$ $p = 0.933$
No	18 (52.9)	14 (51.9)	32 (52.5)	
Tobacco use				
Yes	10 (29.4)	11 (40.7)	21 (34.4)	$X^2 = 0.856$ $p = 0.355$
No	24 (70.6)	16 (59.3)	40 (65.6)	
Alcohol consumption				
Yes	2 (5.9)	1 (3.7)	3 (4.9)	$X^2 = 0.153$[a] p = 1.000
No	32 (94.1)	26 (96.3)	58 (95.1)	

Variable	Experimental group ($n = 34$)	Control group ($n = 27$)	Total sample ($n = 61$)	Test of homogeneity
	Mean ± SD	Mean ± SD	Mean ± SD	
Age	57.85 ± 9.43 *min:42, max:72*	61.37 ± 7.26 *min:47, max:72*	59.41 ± 8.65 *min:42, max:72*	$t = -1.597$ $p = 0.105$
Number of bypassed arteries	2.44 ± 1.02 *min:1, max:4*	2.81 ± 1.24 *min:1, max:6*	2.61 ± 1.13 *min:1, max:6*	$t = -1.290$ $p = 0.202$

[a] Fisher's Exact Test; X^2 = Chi-Square Test; t = Independent Sample *t*-Test; p = Significance value.

Table 3
Between-group and within-group comparison of trait anxiety levels.

Time	Experimental group (n = 34)	Control group (n = 27)	Between-group comparison	Within-group comparison
	Mean ± SD	Mean ± SD		
Day 1 (baseline)	38.38 ± 2.10	36.19 ± 3.97	F = 20.400 Λ = 0.587 $p = 0.000$	$t = 2.600$ d = 0.68 $p = 0.013$*
Day 2	36.29 ± 2.39	36.70 ± 4.07		$t = -0.463$ d = −0.12 $p = 0.646$
Adjusted means (ANCOVA)	*35.92*[a] ± *0.53*[b]	*37.17*[a] ± *0.60*[b]		
Day 3	38.29 ± 2.54	41.70 ± 4.59		$t = -3.457$ d = −0.91 $p = 0.001$**
Adjusted means (ANCOVA)	*37.73*[a] ± *0.55*[b]	*42.41*[a] ± *0.62*[b]		

F = Repeated Measures Analysis of Variance (ANOVA).
ANCOVA: Analysis of Covariance, a = Adjusted mean, covariance appearing in the model are evaluated at the following values: Day 1 (baseline): 37.41, b = Standard Error,
Λ = Wilks' Lambda; t = Independent Sample t-Test; d = Cohen's d for effect size; p = Significance value; *$p < 0.05$; **$p < 0.01$.

Table 4
Perceived pain on the first three days after surgery.

Variable	Experimental group (n = 34)	Control group (n = 27)	Within-group comparison
	Mean ± SD	Mean ± SD	
Perceived Pain	63.82 ± 25.34	81.85 ± 21.66	$t = -2.939$ d = −0.76 $p = 0.005$*

t = Independent Sample t-Test; d = Cohen's d for effect size; p = Significance value; *p < 0.01.

subjective sensation of dyspnoea (Neuman et al., 2006). In the study of Yildirim et al. chemotherapy patients who listened to the self-affirmation recording reported significantly less lack of breath when compared to the control group (Yildirim et al., 2017). In a systematic review where nine studies were explored regarding the effects of various relaxation techniques among patients with heart failure, it was reported that relaxation, meditation, guided imagery, or combinations of these strategies resulted in less dyspnoea (Kwekkeboom & Bratzke, 2016). In another study conducted with 463 patients who underwent coronary artery bypass graft or cardiac valve surgery, it was found that high levels of psychosocial well-being and hopefulness were associated with post-operative freedom from cardiac symptoms (Jenkins et al., 1996). In the present study, dyspnoea was less prevalent among the patients of the intervention group than their counterparts in the control group. Considering the fact that these patients also experienced a significant decrease in their anxiety levels, it can be said that reduced anxiety resulted in reduced dyspnoea (Lapum et al., 2011; Nikolajsen & Jensen, 2001).

Patients' perception regarding palpitations was significantly less common among the patients in the intervention group than their counterparts in the control group. In one study, it was reported that self-affirmation prevented increases in heart rate (Tang & Schmeichel, 2015). Chen et al. investigated the effect of self-affirmation on cardiovascular responses and reported that when the self-affirmed participants received negative emotion induction, they had lower maximum heart rate in comparison to the control group (Chen et al., 2021). Tully et al. highlighted that anxiety reduces parasympathetic nervous-system activity and increases sympathetic nervous system activity, resulting in dysrhythmia (Tully et al., 2011). Palpitations were less common in our intervention group probably because self-affirmation slowed down their heart rate by reducing their anxiety.

Fatigue is a common symptom among individuals with cardiac morbidities while open-heart surgery, a life-changing procedure, can increase the level of perceived fatigue even more (Ai et al., 2012). In the present study, almost two-third of the patients in the control group suffered from severe fatigue while in the intervention group there was only one patient who complained about the same level of fatigue, which demonstrated the significant positive effect achieved with self-affirmation. In fact, certain affirmation sentences of the audio recording specifically focused on the relief of fatigue, such as *"My life energy is increasing day by day"*, *"My body is getting stronger and healthier every day"*. Literature findings also show that fatigue can be improved with positivity. With the use of expressive writing, it was reported that fatigue in fibromyalgia patients decreased in addition to increased well-being (Broderick et al., 2005). Yildirim et al. found significantly less

Table 5
Perceived discomfort on the first three days after surgery.

Perceived discomfort	Experimental group (n = 34)		Control group (n = 27)		X^2 p
	n (%)	Expected n	n (%)	Expected n	
Dyspnoea					
Never	10 (29.4)	*8.4*	5 (18.5)	*6.6*	X^2 = 11.648
Mild	24 (70.6)	*21.2*	14 (51.9)	*16.8*	*p* = 0.002*
Severe	0 (0.0)	*4.5*	8 (29.6)	*3.5*	
Palpitations					
Never	21 (61.8)	*15.6*	7 (25.9)	*12.4*	X^2 = 7.784
Mild	13 (38.2)	*18.4*	20 (74.1)	*14.6*	p = 0.005*
Severe	—	—	—	—	
Fatigue					
Never	11 (32.4)	*6.7*	1 (3.7)	*5.3*	X^2 = 31.909
Mild	22 (64.7)	*16.2*	7 (25.9)	*12.8*	p = 0.000**
Severe	1 (2.9)	*11.1*	19 (70.4)	*8.9*	
Nausea					
Never	27 (79.5)	*21.2*	11 (40.8)	*16.8*	X^2 = 9.863[a]
Mild	6 (17.6)	*10.0*	12 (44.4)	*8.0*	p = 0.005*
Severe	1 (2.9)	*2.8*	4 (14.8)	*2.2*	

[a] Fisher's Exact Test; X^2 = Chi-Square Test; p = Significance value; *p < 0.01; **p < 0.001.

tiredness among chemotherapy patients by using auditory self-affirmation with and without additional nature sounds (Yildirim et al., 2017). Ai et al. explored the effect of prayer coping in cardiac surgery survivors and reported a positive correlation between preoperative anxiety and postoperative physical fatigue (Ai et al., 2012). Once again, it can be said that the relief obtained in the anxiety levels of the patients resulted in decreased discomfort, including fatigue.

Nausea is a major complication of cardiac surgery and is associated with anaesthesia, pain, and anxiety (Lavi et al., 2011; Mace, 2003; Sawatzky et al., 2014). In the present study, the patients who listened to self-affirmation experienced significantly less nausea than the patients in the control group. Rodrigues et al. reported that among cardiac surgery patients, preoperative depressive symptoms were more common in patients who presented nausea during their postoperative recovery (Rodrigues et al., 2018), which reminds the importance of positive thinking in relieving physical symptoms. Similarly, Yildirim et al. reported less nausea in chemotherapy patients who listened to self-affirmation recordings (Yildirim et al., 2017). Considering that pain and anxiety are the major causes of postoperative nausea and vomiting among cardiac surgery patients (Mace, 2003), the result obtained regarding the decreased postoperative nausea can be seen as a secondary positive outcome of decreased pain and anxiety in the present study.

4.1. Limitations of the study

One of the most important limitations of this study is the fact that it was conducted in a single center. As reported by Unverzagt et al., single center trials tend to provide larger treatment effects than the multi-centred ones (Unverzagt et al., 2013). Therefore, the results obtained in this single centered study should be cautiously used for decision making. On the other hand, the results are sample-specific and therefore cannot be generalized to a wider patient population and to another surgical intervention.

Additionally, some individuals were more inclined to be optimistic by their nature, and this individual characteristic is affecting positively their potential to deal with challenging and stressful events (Forgeard & Seligman, 2012), so it may be easier for them to internalize positive affirmations. Presence of individuals in the sample who have a character in this direction, may be considered as a confounding variable, which is another limitation that may have influenced the data.

It is desirable to ensure homogeneity in the medical characteristics of patients in randomized controlled trials as optimal as possible, however, this can be very challenging in complex surgeries such as CABS. In this context, the lack of advanced analysis regarding certain medical characteristics (such as the duration of surgical intervention, extubation time, and other health conditions) and their possible effect on the primary and secondary measures of the study must be considered as a statistical limitation of the study.

Finally, it is important to mention that using per protocol analysis may be seen as a limitation in this randomized controlled trial (Tripepi et al., 2020), however, the nature of this study required this type of analysis because one of the key elements of positive self-affirmations is daily repetition (Leon, 2006). Since the repetitions are highly important in the intervention group, only the patients who strictly adhered to the affirmation protocol considered in the statistical analysis.

5. Conclusion

Self-affirmation helped to reduce anxiety and perceived discomfort (pain, dyspnoea, palpitations, nausea) in patients who underwent cardiac surgery. The use of self-affirmation is an easy-to-use and cost-effective method which can be used both in a way of repetitive writing or by repetitive listening. However, considering the fact that cardiac surgery patients are often physically and psychologically fatigued, the use of auditory self-affirmation recording is an easier but still effective alternative. Furthermore, it is a method that can be included in the nursing care plan of patients in cardiac surgery units as routine care both in preoperative and postoperative periods. Future studies are required to examine the effects of self-affirmation starting from the preoperative period in cardiac surgery patients in order to control more efficiently pre- and post-operative symptomatology and complications.

CRediT authorship contribution statement

Meltem Yildirim: Conceptualization, Methodology, Formal analysis, Writing - Original Draft, Writing - Review & Editing, Supervision.
Sevim Akbal: Conceptualization, Methodology, Writing-Original draft preparation.
Meryem Turkoglu: Investigation, Writing-Original draft preparation.

Declaration of competing interest

The authors declare that there is no conflict of interest.

Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

Acknowledgments

We would like to thank all participants for their time and effort.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

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