

The role of music in outpatient prostate biopsy: A comprehensive literature review

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ABSTRACT

Prostate biopsy is a standard urological procedure and a valuable tool for identifying prostate cancer. To assess the effect of music on outpatient prostate biopsy, we aimed to conduct a systematic review of literature to understand if music reduced the use of analgesics and anxiolytics.

The systematic review was performed in line with the Cochrane guidelines and Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist. The databases searched included MEDLINE, Scopus, CINAHL, Clinicaltrials.gov, EMBASE, Cochrane library, and Google Scholar, from inception of databases to February 2021. The primary outcome measures were the effect of music on pain and anxiety from the procedure.

The initial search yielded 212 articles and after going through titles and abstracts, and six studies (570 patients) were included for the final review. It included five randomized-controlled trials and one case-control study.

These studies were done in Korea, USA, Taiwan, and Turkey. Patients had a combination of either local anesthetic gel or periprostatic nerve block or intravenous pethidine. The choice of music was varied and most offered a choice of music to patients. Four of the six studies showed significantly reduced pain and anxiety with the use of music, and the willingness for repeat procedures was higher in two studies.

This review has demonstrated that listening to music is associated with reduced anxiety and pain during prostate biopsy. It is likely to, therefore, increase procedural satisfaction, and willingness to undergo the procedure again considering repeated biopsy is sometimes needed in these patients. As music is simple, inexpensive, and easily accessible, it should be routinely offered to patients for outpatient and office-based urological procedures.

Keywords: Anxiety; biopsy; complementary therapy; music; pain; prostate.

Introduction

Prostate biopsy is a standard urological clinical procedure and a valuable diagnostic tool for identifying prostate cancer.¹ Studies have shown that anxious moods amongst men increased at the time of the biopsy despite its diagnostic significance.² Furthermore, a prolonged operative biopsy time combined with preprocedural anxiety can increase pain for patients undergoing the procedure without anesthesia and cause them to be unwilling to

undergo biopsy again without anesthesia.³ Finally, prolonged preprocedural waiting periods also have a detrimental effect on patient anxiety.⁴ The probe design and needle guide have an additional impact on pain during each step.⁵ Further to this, the routine use of local analgesia has been suggested, with periprostatic block being superior according to the European Association of Urology Guidelines.¹ However, a significant number of patients refuse to undergo the procedure without the use of general anesthesia.^{2,3} This option is

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neither widely accepted nor available⁶; therefore, it is essential to find nonpharmaceutical ways to reduce pain further. Music distracts the listener through pain modulation by activating the cingulo-frontal cortex to reduce the pain perceived.⁷ The role of music has been previously proven to be beneficial on urological outpatient procedures by decreasing anxiety and pain.⁸ This paper aims to assess the role of music in outpatient prostate biopsy and its effects.

Material and Methods

Study Population

PICO (population, intervention, control, and outcomes) criteria:

Population: adults undergoing prostate biopsy

Intervention: music

Comparator: no music

Outcome: results (analgesia and anxiety)

Evidence Acquisition

We searched for English-written articles reporting on adults undergoing prostate biopsy. We included randomized control trials (RCTs) and prospective and observational studies. Selected studies evaluated and reported results related to the impact of music on pain and anxiety levels and resenting Visual Analogue Scale (VAS), State Anxiety Inventory (SAI), State-Trait Anxiety Inventory (STAI) scores, and baseline and disease characteristics. We excluded non-English language articles, reviews, comments, editorials, grey literature, and studies where outcomes of interest were not presented.

Search Strategy and Selection Criteria

We performed this systematic review following the Cochrane Collaboration guidelines⁹ and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) check-

list.¹⁰ The databases searched included MEDLINE, Scopus, CINAHL, EMBASE, Clinicaltrials.gov, Cochrane Library, and Google Scholar from January 1, 1990 to February 28, 2021. The search terms included but were not limited to “music,” “sound,” “complementary therapy,” “pain,” “anxiety,” “biopsy,” “outpatient,” “prostate,” “TRUS,” and “complementary medicine.” Such terms were combined using Boolean operators to refine the search. Reference lists of relevant articles were also hand-searched. Two reviewers (SB and TT) independently identified all studies that fitted our inclusion criteria for the review, and discrepancies were resolved by consensus with the senior author (BKS).

Inclusion criteria were as follows: RCTs and prospective studies in English language reporting on adults undergoing prostate biopsy. Exclusion criteria were as follows: non-English language articles; review articles or case reports; studies that did not present outcome of interest.

Data Extraction and Analysis

The primary outcome measures were the effect of music on pain (measured using a VAS) and anxiety (using STAI). Information was also collected on study design, patient demographics, year of publication, type of music and delivery method if available, and VAS and STAI scores. Data were collected using Microsoft Excel 2019 (version 19.0).

Results

Our initial search identified 212 records (Figure 1). After excluding 71 duplicates, 133 abstracts were assessed, of which nine full-text articles were assessed. Six studies (570 patients) were ultimately included in the quantitative synthesis. This selection included five randomized controlled trials and one case-control study.

A summary of the research methods used is presented in Tables 1 and 2. An ultrasound-guided approach was taken in five studies, with one study using a magnetic resonance imaging (MRI)-guided approach in some patients. One study utilized only intrarectal lidocaine gel (2%), one study used prilocaine (1%) nerve block, two studies utilized a combination of intrarectal lidocaine gel with a periprostatic nerve block, and one group used a combination of lidocaine gel with intravenous pethidine. Four studies selected music for patients, including classical music, classic rock, and selecting specific pieces. Two studies offered patients a choice of different types of music. All studies used the VAS to assess pain, and all studies used elements of the STAI to assess anxiety (Table 2). Due to study

Main Points

- Listening to music is associated with reduced anxiety and pain during prostate biopsy.
- Music is likely to increase procedural satisfaction, and willingness to undergo the procedure again considering repeated biopsy is sometimes needed in these patients.
- As music is simple, inexpensive, and easily accessible, it should be routinely offered to patients for outpatient and office-based urological procedures.

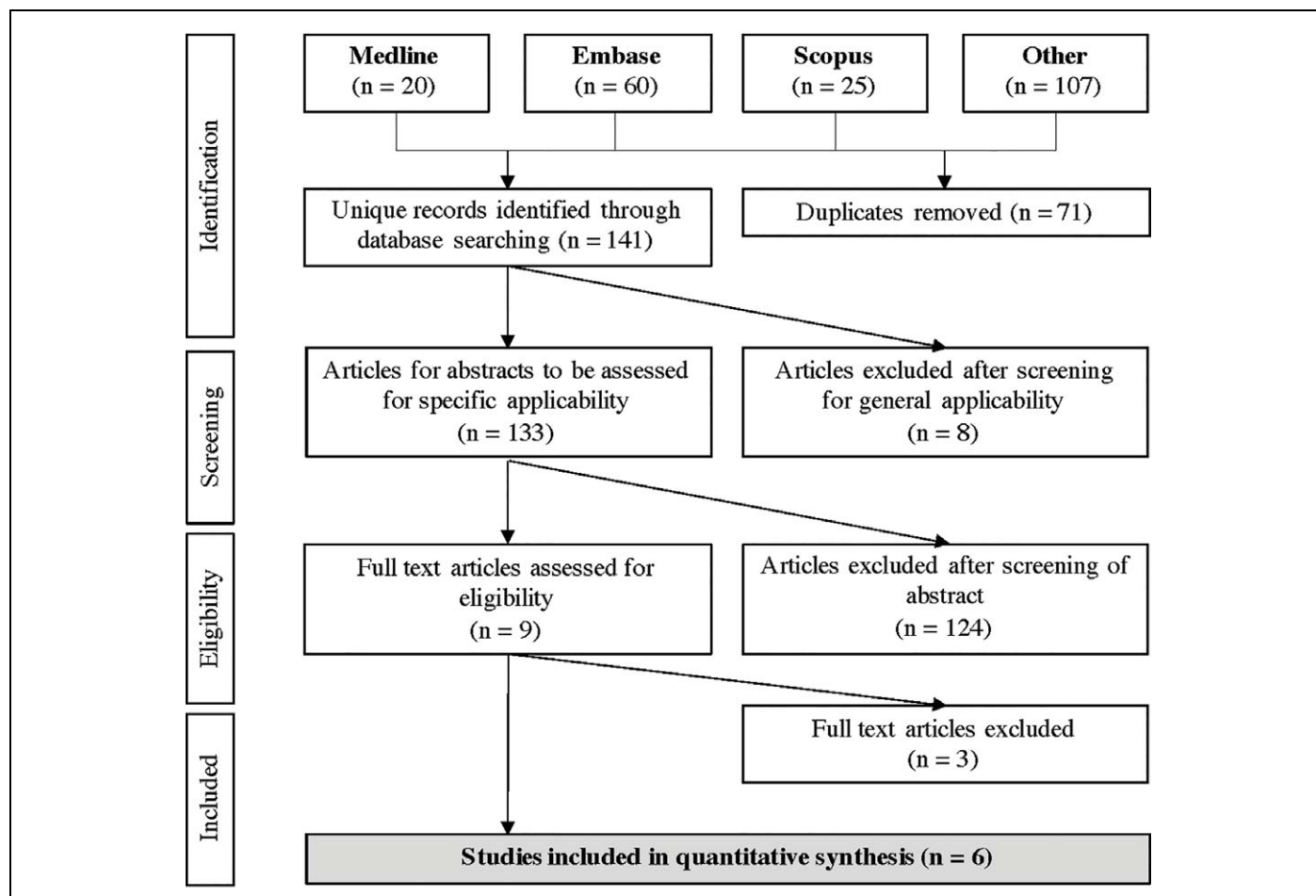


Figure 1. PRISMA flowchart of the included studies.

heterogeneity and the nonstandardized quality appraisal, a narrative synthesis was performed.

Individual Studies

Chang et al⁶ performed a pilot randomized controlled trial to investigate whether listening to music reduced anxiety, pain, and dissatisfaction. Seventy-six male participants were randomized into two groups. In group 1 ($n = 38$), participants did not listen to music, while in group 2 ($n = 38$), participants listened to classical music. Patients reported their satisfaction, pain, and “ability to tolerate a second biopsy” scores on a VAS scale during the procedure. An STAI scale was also used to assess anxiety and contained two separate 20 item multiple-choice subscales that measured trait (baseline) and state (situational) anxiety. Psychological parameters associated with pain were also assessed. The results showed that the anxiety scores in group 1 (mean 47.6 ± 4.05) were significantly higher than in group 2 (40.9 ± 4.05 ; $P = .001$). The pain score of group 2 (mean 4.66 ± 2.03) was significantly lower than those of group

1 (mean 6.29 ± 2.49 ; $P = .003$). The satisfaction score of group 2 was significantly higher (mean 7.42 ± 1.62) than those of group 1 (mean 6.18 ± 2.20 ; $P = .007$). Additionally, post-procedural heart rate and systolic blood pressure levels were significantly higher in group 1 than in group 2 ($P = .014$ and $.011$, respectively). Finally, group 2 patients were significantly more willing to undergo a repeat TRUS-guided biopsy. In summary, this study showed that listening to music during TRUS-guided prostate biopsy significantly reduced patients feeling of dissatisfaction, pain, and discomfort.

Another study was conducted by Cho et al¹¹ who performed a randomized prospective trial on the effect of music on reducing anxiety during transrectal ultrasound-guided prostate biopsy. Forty men referred for a prostate biopsy were recruited for the study and allocated randomly into two groups. In group 1 ($n = 20$), participants were allocated to musical conditions by listening to music ballads, while in group 2 ($n = 20$), they were allocated to no music. The authors assessed anxiety and pain

Table 1. Details of the Included Studies

Study	Country	Design	N	Biopsy Indication	Biopsy Strategy	Type of Anesthesia	Music	Scoring Systems
Chang	Korea	RCT: <i>music vs no music</i>	76	Elevated PSA and/or abnormal DRE	Ultrasound guided 12 core	2% lidocaine gel	Classical music	VAS, STAI
Cho	Korea	RCT: <i>music vs no music</i>	40	Elevated PSA and/or abnormal DRE	Ultrasound guided	1% prilocaine injection	Patient choice	VAS
Packiam	USA	RCT: <i>music vs no music</i>	182	NR	12-core, some MRI guided	Lidocaine 10 mL	Classic rock	VAS, STAI
Tsivian	USA	RCT: <i>music vs headphones vs no music</i>	88	Elevated PSA and/or abnormal DRE	Ultrasound guided 12 core	2% lidocaine gel then 10 mL 1% lidocaine injection	Johann Bach Brandenburg concertos	VRS, VAS, MPQ, STAI
Chiu	Taiwan	Case-control: <i>music vs no music</i>	82	Elevated PSA	Ultrasound guided	IV pethidine 25 mg, lidocaine jelly	“Twilight’s Embrace” by Kevin Kern	VAS, SAI
Turgut	Turkey	RCT: <i>music and video vs no music or video</i>	102	Elevated PSA and/or abnormal DRE	Ultrasound guided	2% lidocaine gel then 5 mL lidocaine injection	Patient choice	VAS, STAI

RCT, randomized controlled trial; PSA, prostate specific antigen; DRE, digital rectal examination; MRI, magnetic resonance imaging; VAS, Visual Analogue Scale; STAI, State-Trait Anxiety Inventory; MPQ, McGill Pain Questionnaire; VRS, Verbal Response Scale; NR, not reported.

before the procedure, during anesthesia, and during and after the biopsy. The results demonstrated a statistical difference between anxiety scores before the biopsy (music, mean = 5.6 ± 1.8 ; control, mean = 4.2 ± 1.7 ; $P = .046$). There was no significant difference in anxiety after the biopsy (music, mean = 4.1 ± 2.1 ; control, mean = 5.0 ± 2.6 ; $P = .303$). There was no difference in pain scores (music, mean = 5.6 ± 2.5 ; control, 5.6 ± 2.4 ; $P = .865$) immediately after biopsy. These results are difficult to interpret without measuring baseline anxiety before the intervention of music, and therefore being unable to control for this as a potential confounding variable.

Another randomized controlled trial by Packiam et al¹² analyzed the results of 182 men who underwent transrectal prostate biopsy who were randomly assigned to music (n = 85) or control (n = 97) groups. Preprocedural questionnaires were issued to participants, and the postprocedural questionnaire was given to them after they exited the biopsy suite. The authors demonstrated that there were comparable percentages of patients who desired music in the music group (91%) vs the control group (95%) in the preprocedural outcomes. On the postprocedural questionnaire, there were no significant differences between the music and control groups in pain score (mean 2.3 ± 2.1 vs 2.0 ± 2.1 , $P = .34$) and satisfaction (mean

8.2 ± 2.7 vs 8.1 ± 2.9 , $P = .29$). There were no differences in mean STAI-trait (mean 32.4 ± 8.6 vs 30.9 ± 7.7 , $P = .020$) or STAI-state (mean 33.7 ± 8.9 vs 34.4 ± 9.9 , $P = .61$) scores between the music and control groups. The results of the study showed no significant effect of music on anxiety and pain during prostate biopsies.

Tsivian et al¹³ assessed the effect of noise-canceling headphones or music on pain perception and anxiety in men undergoing transrectal prostate biopsy. A cohort of 88 patients was randomized into the music group (n = 31), noise-canceling headphones group (n = 29), and control group (n = 28). Pre-biopsy pain scores were measured with VAS, Verbal Response Scale (VRS), and McGill Pain Questionnaire (MPQ) and were comparable across the three groups. Mean STAI trait scores were measured pre- and post-biopsy, finding no statistically significant change within the music (pre 46.2 vs post 44.9; $P = .128$), noise-canceling headphone (pre 48.1 vs. post 46.7; $P = .193$), and control groups (pre 45.5 vs post 46.4; $P = .787$), with a similar nonsignificant finding in STAI state scores. The VAS pain scores did not significantly differ between music (mean = 0.58), headphone (mean = 0.88), and control (mean = 0.82; $P = .397$) groups, with a similar nonsignificant finding for the MPQ. The overall implication of the results reported

Table 2. Outcomes of the Included Studies

Study	Group	N	Duration (Minutes; Mean \pm SD)	Anxiety (STAI; Mean \pm SD)		Pain (VAS; Mean \pm SD)		Satisfaction (Mean \pm SD)
				Pre	Post	Pre	Post	
Chang	Music	38	11.2 \pm 1.65	NR	4.66 \pm 2.03	NR	40.9 \pm 6.37	7.42 \pm 1.62
	Control	38	11.4 \pm 1.73	NR	6.29 \pm 2.49	NR	47.6 \pm 4.05	6.18 \pm 2.20
Cho	Music	20	NR	5.6 \pm 1.8	4.1 \pm 2.1	NR	5.6 \pm 2.5	NR
	Control	20	NR	4.2 \pm 1.7	5.0 \pm 2.6	NR	5.6 \pm 2.4	NR
Packiam	Music	85	12 [9.18] [†]	NR	32.4 \pm 8.6	NR	2.3 \pm 2.1	8.2 \pm 2.7
	Control	97	11 [9.15] [†]	NR	30.9 \pm 7.7	NR	2.0 \pm 2.1	8.1 \pm 2.9
Tsivian	Music	31	NR	46.2 (47, 43-50)	44.9 (46.0, 41.0-49.0)	0.58 (0, 0-0.5)	1.86 (1, 0-3)	NR
	Headphone	29	NR	48.1 (49, 46-50)	46.7 (48.0, 41.8-50.3)	0.88 (0, 0-1)	1.96 (1, 0-3)	NR
	Control	28	NR	45.5 (45, 42-49)	46.4 (47.0, 44.0-50.0)	0.82 (0, 0-0.3)	1.81 (1.5, 0-2.8)	NR
Chiu	Music	41	7.29 \pm 1.49	32.83 \pm 7.91 [‡]	27.9 \pm 6.52 [‡]	1.17 \pm 1.2	2.49 \pm 2.46	NR
	Control	41	7.39 \pm 1.79	35.49 \pm 9.68 [‡]	34.12 \pm 10.54 [‡]	0.46 \pm 0.81	3.41 \pm 2.55	NR
Turgut	Music and video	51	NR	36.5 \pm 36	29.6 \pm 1.4	2.59 \pm 0.7	3.7 \pm 1.4	NR
	Control	51	NR	40.1 \pm 2.3	37.7 \pm 3.3	3.72 \pm 1.9	4.72 \pm 1.2	NR

STAI, State-Trait Anxiety Inventory; VAS, Visual Analogue Scale; NR, not reported.

STAI trait score reported unless otherwise noted.

[†]Median [IQR].

[‡]STAI state score.

indicates the expected finding that prostate biopsy significantly increases pain after biopsy with no change in anxiety levels. A further interpretation of the results is that there is no impact of music and noise-canceling headphones on pain during prostate biopsy.

A case-controlled study by Chiu et al¹⁴ recruited 82 patients admitted to a community hospital for a Transrectal Ultrasound Scan (TRUS) biopsy of the prostate. All patients were randomly allocated into an intervention group provided with stress management and a control group that received only routine nursing care. The stress management included one-on-one simulation education and music therapy. Using a Generalized Estimating Equation, the authors demonstrated that anxiety-state levels significantly decreased by 3.57 ($P < .05$) compared to those in the control group when accounting for cross-interaction effects. Additionally, when accounting for cross-interaction effects, pre- and post-biopsy pain (VAS) scores significantly decreased by 1.63 ($P < .01$) when compared with those in the control group. There was also a significantly lower increase in diastolic blood pressure pre- and post-biopsy in the

music group (-9.05 , $P < .05$) when compared to the control group and accounting for cross-interaction effects. There was no significant improvement in systolic blood pressure, heart rate, or breathing rate concerning other measures.

Turgut et al¹⁵ recruited 102 patients for TRUS-guided prostate biopsy. Patients were randomly allocated to a control ($n = 51$) group and an intervention group ($n = 51$). Patients in the intervention group watched a 5-minute animation video, explained details, and then completed an STAI form. After the biopsy was planned, patients were asked to choose music for the procedure to make them feel comfortable. They were not restricted in their choice of music, and their music selection was played continuously during the procedure. Headphones were not used while listening to music. Patients filled out their VAS pain scores immediately after the procedure. A significant decrease was found between the pre- and post-biopsy STAI anxiety scores in the experimental group (36.5 ± 36 vs 29.6 ± 1.4 ; $P < .001$) and the control group (40.1 ± 2.3 vs 37.7 ± 3.3 ; $P = .001$), with the experimental group having significantly lower post-biopsy anxiety levels than the control group (29.6 ± 1.4

vs 37.7 ± 3.3 ; $P < .001$). Regarding pain results, a significant increase was found between the pre- and post-biopsy VAS scores in the experimental group (2.59 ± 0.7 vs 3.7 ± 1.4 ; $P < .001$) and the control group (3.72 ± 1.9 vs 4.72 ± 1.2 ; $P = .008$). Although the experimental group had a significantly lower pain score post-biopsy ($P = .01$), this group also had a significantly lower pain score pre-biopsy ($P < .02$). These results are difficult to interpret as, without a baseline pain measurement, it is not possible to rule out a sampling error.

Discussion

The current review highlights a beneficial impact of music in outpatient transrectal prostate biopsy. The use of music achieved a significant anxiety reduction in four out of six studies, while it reduced pain in four out of six studies. Furthermore, in two out of six studies, the authors could demonstrate the procedural duration reduction by applying music during biopsy. Finally, in two out of six studies, patients were willing to listen to music, and willingness to repeat the procedure was also higher. The findings of our review support the dissemination of music as an adjunct for any outpatient prostate biopsy procedure.

A clear advantage of music is its low cost, noninvasive nature, and ease of delivery, and implementing a pathway for its application during the procedure would be relatively straightforward. Moreover, it could be tailored to specific procedural needs. Until now, listening to music has helped reduce the dose of sedative medications and decrease discomfort and anxiety experienced in invasive procedures like colonoscopy^{16,17} and colposcopy.¹⁸ Additional research has demonstrated that classical music reduces anxiety during intravitreal injections in the outpatient setting.¹⁹ Researchers also showed that music significantly decreases stress hormone levels, physiological parameters, acute procedural pain, and anxiety during port catheter placement.²⁰ Music can also be used for patients before and during a biopsy procedure to decrease pain and anxiety levels.²¹ In the field of urology, music has proven its value in outpatient urological surgical interventions like shock wave lithotripsy, urodynamic studies, percutaneous nephrostomy tube placement, and cystoscopy.⁸ Additionally, several SWL studies have demonstrated an increased power and more pulses during a shorter procedure duration.^{22,23}

Nevertheless, some patients may not wish to listen to music. According to some researchers, it may lead to medical errors due to miscommunication of potentially critical information, and therefore it should be utilized with extreme caution.²⁴ Considering the aging population, this could be particularly rele-

vant during a prostate biopsy since music may render specific instructions slightly complex during the procedure. Hence, some studies have excluded elderly patients or those with a hearing impairment. Therefore, we suggest that although it would be suitable for most patients, outpatient music therapy should be tailored individually. In addition, it may be less feasible in case of a necessary intraprocedural communication between the practitioner and the patient. Alternative approaches like noise-cancelling headphones have also been utilized but offer uncertain outcomes.¹³

An obvious limitation inherent to this kind of therapeutic intervention is the lack of study blinding of patients and clinicians. In addition, different approaches to deliver music were adopted, including sound systems or personal headphones. Nonetheless, in a meta-analysis of music for postoperative pain relief, the authors highlighted that choice of music and delivery did not influence the overall results.²⁵ In this work, certain study groups allowed the patient to choose the music, while others used a single selection for everyone. Finally, included studies did not provide enough evidence for a cost-effective analysis. Therefore, since cost savings could be achieved through reduced analgesic prescriptions, incorporating this parameter in future studies could be beneficial.

We expect that further studies will follow due to increased attention to music during such procedures. These studies should ideally be in a multicenter setting and supported by large sample sizes. This would allow experts to create formal recommendations about delivering such a practice and include its role in urology guidelines. Given the ample demographic of elderly patients requiring outpatient urology procedures, research on the effect of aging on music would be worth exploring. Furthermore, in the era of MRI/ultrasound (US) fusion prostate biopsy, procedures may last longer, mainly due to prolonged registration, prostate segmentation, and targeting.^{26,27} Especially, transperineal MRI/US fusion biopsies are considered more invasive and are usually performed under general anesthesia,²⁸ although there are studies in the literature reporting that the pain level of MR fusion biopsy is similar to that of standard biopsy.²⁹ Nevertheless, during the last years, there have been efforts in performing freehand transperineal MRI/US fusion biopsies with local anesthesia in an outpatient setting.³⁰⁻³⁴ Of note, there is a shift of clinical interest toward transperineal biopsies due to antibiotic-resistant bacteria development.³⁵⁻³⁷ Therefore, music could prove to be a valuable tool in making transperineal biopsies more pleasant to patients.

Clinicians who want to offer music for prostate biopsy should counsel patients of the benefits and offer them a choice of preferred music in the listening device apt for them. Care must be

taken to ensure it does not interfere with the communication during the biopsy, and the experience is enjoyable for the patients. It is an in-expensive, nonpharmacological, and noninvasive intervention, which can help alleviate patient anxiety and help to relax them.

Conclusion

We evaluated the positive effects of music on outpatient prostate biopsy. This seems to decrease anxiety and pain and might serve as a valuable adjunct to increase procedural satisfaction and willingness to undergo a procedure again. Further research is needed to gather evidence from which formal recommendations can be established.

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