

Influence of Music Intervention on First Wake up Anesthesia Period, Some Physiological and Hematological Parameters in Dogs

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Abstract: Physiological and metabolic effects of listening to music have been widely studied in human and also animal models. The aim of this study was to evaluate the effects of different types of music interventions on first wake up anesthesia period, some physiological and hematological parameters during ovariohysterectomy in dogs. Healthy 24 dogs were divided into equal 3 groups before the ovariohysterectomy; control (N = 8), Sufi Music-treated (N = 8) and Heavy Metal Music-treated (N = 8) groups. Music intervention was performed with using music system and sound levels were set as 60 dB. The physiological parameters were detected in every 5 minute during ovariohysterectomy. Blood samples were collected from all groups before first incision and immediately after the last stitch the operation. Results showed that physiological parameters such as heart rate, blood pressure, temperature, saturation of oxygen, and respiratory rate of dogs were affected neither Heavy Metal nor Sufi Music interventions during ovariohysterectomy, when compare to control group. Blood parameters such as RBC, WBC, Hb, Hct, PLT, MCV, MCH and MCHC also not changed statistically in the groups. First wake up anesthesia period was found shorter ($p < 0.01$) in Heavy Metal Music-treated group (33.38 ± 1.43 min) than control group (37.88 ± 1.61 min). Sufi music-treated group ($40, 88 \pm 0,64$ min) had longest first wake up anesthesia period than Heavy Metal Music-treated group, but did not differ control group. In conclusion, Sufi and Heavy metal music was found to be ineffective on first wake up anesthesia and some physiological and hematological parameters under the ovariohysterectomy in dogs.

Keywords: dog, music, anesthesia, ovariohysterectomy, first wake up, hematology, physiological parameters.

Müzik Uygulamasının Köpeklerde Anesteziden İlk Uyanma Periyodu ile Bazı Fizyolojik ve Hematolojik Değerler Üzerine Etkileri

Özet: Müziğin insan ve hayvanların fizyoloji ve metabolizması üzerindeki etkileri üzerinde birçok çalışma yapılmıştır. Bu çalışmanın amacını ovariohisterektomi operasyonu uygulanan dişi köpeklerde müzik uygulamasının anesteziden ilk uyanma periyodu ile bazı fizyolojik ve hematolojik değerler üzerine etkileri oluşturmuştur. Bu çalışmada 24 adet dişi köpek Sufi, Ağır Metal ve kontrol grupları olmak üzere üç eşit gruba ayrıldı. Müzik uygulaması için ses seviyesi 60Db olarak ayarlandı. Ovariositektomi sırasında fizyolojik parametreler her 5 dakikada bir kaydedildi. İlk kesiden önce ve son dikişin hemen ardından tüm gruplardan kan örnekleri toplandı. Kalp atım hızı, kan basıncı, sıcaklık, oksijen doygunluğu ve solunum hızları gibi fizyolojik parametrelerin, kontrol grubuna göre, ne Ağır metal ne de Sufi müzik uygulamalarından etkilemediği tespit edildi. RBC, WBC, Hb, Hct, PLT, MCV, MCH ve MCHC gibi kan parametreleri de gruplar arasında istatistiksel olarak değişim göstermedi. Anesteziden ilk uyanma periyodu, Ağır metal müzik uygulanan grupta (33.38 ± 1.43 dk) kontrol grubuna ($37,88 \pm 1,61$ dk) göre daha kısa bulundu ($p < 0.01$). Sufi müzikle tedavi edilen grup ($40, 88 \pm 0,64$ dk) en uzun ilk uyanma periyoduna sahipti ancak kontrol grubu ile arasında önemli bir fark yoktu. Sonuç olarak, köpeklerde anesteziden ilk uyanma periyodu, bazı fizyolojik ve hematolojik parametreler üzerinde Sufi ve Ağır metal müzik uygulamasının herhangi bir etkisi bulunmamıştır.

Anahtar Kelimeler: köpek, müzik, anestezi, ovariohisterektomi, ilk uyanma, hematoloji, fizyolojik parametreler

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INTRODUCTION

Physiological, metabolic and psychological effects of listening to music have been widely studied in human and also animal models (1, 2). In these studies, the music was found effective on sensory, endocrine and physical-motor reactions such as changes in the metabolism, breathing rate, arterial blood pressure and muscle tone in humans (3). Researches have focused on using the music for complementary therapy in human and some animal species (4-6). In recent years, music was used for intra and postoperative pain management and reduces to stress and anxiety, relaxation, anesthesia progress, neural and cardiac functions (6, 7). Heavy Metal music is a genre of Rock music includes strong sound, beat and personal style (8). In many studies, Heavy Metal music was found uncomfortable for human and animal models (9, 10).

The music was used for the treatment to patients with mental problems and also for physical diseases in Hospital of the Sultan Bayezid II in Ottoman Emperor (11). The Ney (a reed flute, musikal) is a Turkish folk instrument and known as a symbol of Sufi music. Instrumental reed flute music includes a low pace, without strong beat and fluctuating rhythms (12, 13). It has been theorized that Sufi music has the most recreative effect on people's psychological state and relaxation (14).

Ovariohysterectomy is a common surgical practice in veterinary medicine. Traditional ovariohysterectomy practice includes removal of the uterus and ovaries of the dogs for control of canine population, inconvenience of vaginal discharge, male attraction during estrus and also prevent to the animals from some diseases such as pyometra and mammary cancer (15). All of the process is carried out under the general anesthesia. Dissociative anesthesia including Xylazine and Ketamine HCl is used as general anesthetic because of their availability and practical characteristics. In some cases, an additional dose of Ketamine may require for extending process during ovariohysterectomy (16). Application of Ketamine HCl can cause intraoperative problems such as hypotension, arrhythmia, respiratory depression, pain and anxiety in animals (16, 17).

The aim of this study was to evaluate the effects of different music types on first wake up period and some physiological, hematological parameters during ovariohysterectomy in dogs.

MATERIALS and METHODS

Animals and study design

The determining of the minimum number of groups with using power analyses which was considered the α risk to be 0.05, the power of the study 80 %, the π_2 -10 % and hoping an improvement of at least 30 % (18). The minimum sample size was estimated at 27 dogs, enrolled into 3 groups of 9 dogs each. The calculation of the sample was done online at: <http://marne.u707.jussieu.fr/biostatgv/>. Thus healthy 27 female crossbred dogs which brought to clinics for ovariohysterectomy from an institution called Association of Right to Life, Bishkek, Kyrgyzstan were used for the trial. Nevertheless 3 dogs were excluded from the study because of ovarian (cytic ovarian disease) and uterine disorders (mucometra and hydrometra) detecting during the operation. General health examination of the dogs was performed preoperatively. Only healthy dogs were included the study. Animals were operated and hospitalized at Research and Application Center in Kyrgyz-Turkish Manas University.

Dogs were divided into equal 3 groups as control (n = 8), Sufi music-treated (n = 8) and Heavy Metal music-treated (n=8). The weights and ages of groups were close to each other and shown in Table - 1.

Table-1. Age and weight values of the experimental groups (Control, Sufi music and Heavy metal music).

Music Groups	No	Age (month)	Weight (kg)
Control	1	24	10
	2	36	7
	3	24	9
	4	24	11
	5	48	10
	6	24	11
	7	36	10
	8	7	10
Sufi	1	36	7
	2	24	7
	3	18	15
	4	24	5.5
	5	24	10.5
	6	12	7.5
	7	18	10
	8	36	14
Heavy metal	1	24	13
	2	36	10
	3	36	12
	4	36	10
	5	24	22
	6	24	5.6
	7	12	18
	8	12	10

The dogs were fed ad libitum and feeding was stopped 24 h before the anesthesia till 12 hours after operation. Operation room was 12 square meters and temperature of the room was set between at 24-25 0C degrees during ovariohysterectomy. Ovariohysterectomy Operations were performed as described by Davidson et al. (15).

First wake up and anesthesia period

All of the dogs were exposed to the dissociative anesthetic applications (Xylazine (Rompun, Germany), 1 mg kg-1 and Ketamine HCl (Alfasan, Netherland), 10 mg kg-1) before the ovariohysterectomy (Interval 10 min). Duration of first wake up and anesthesia period was recorded with timer (Fisher Scientific Clip-On Stopwatch, USA).

Music application

Music application was performed with using music system (Sony hp33, Japan). The sound levels of the music types (Sufi and Heavy Metal Music) was set as 60 dB (high-frequency hearing limit) which tested for dogs before by H.E Heffner (19), measured by sound level meter (RadioShack, USA).

The physiological parameters

The physiological parameters (heart rate, blood pressure, temperature, saturation of oxygen, respiratory rate) were observed and noted in every 5 min during ovariohysterectomy. Physiological parameters were measured by using Veterinary Monitor (Guoteng GT9003, China).

Hematological parameters

Blood samples were collected from all groups to heparinized tubes before 3 min (first incision) and immediately after the last stitch (3 min) the ovariohysterectomy in same time periods every day. Red blood cell (RBC) count, white blood cell count (WBC), hemoglobin (Hb), hematocrit (Hct), blood clot cell count (PLT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) values were measured with Auto Hematology Analyzer (Mindray BC-5300, Chine).

Statistically Analyse

Sample t-tests and One way anova tests were used to determine the difference between the groups. The SPSS software program (Version 22.0, SPSS Inc., Chicago, IL, USA) was used for statistical analysis.

RESULTS

Physiological parameters

Physiological parameters such as heart rate, blood pressure, temperature, saturation of oxygen, respiratory rate of dogs were displayed shown in Table - 2 and both Heavy Metal and Sufi Music interventions during ovariohysterectomy were found to be smiliar effect on these parameters, when compared to control.

Table – 2. Some average physiological parameters of dogs during ovariohysterectomy.

Music groups	O2 Saturation (%)	P Arterial Pressure (mmHg)	Respiration Rate (Breath/min)	Hearth Beat (Beat/min)	Temperature (0C)
Control	87.74± 5.0	113.25± 30.8	14.01± 2.2	64.70± 4.0	37.10± 0.9
Sufi	87.01± 5.8	141.62± 17.8	13.55± 1.7	67.47± 4.3	37.36± 0.3
Heavy metal	88.74± 6.1	135.25± 35.2	13.06± 1.9	67.71± 6.0	36.32± 1.1

p > 0,05

Hematological Parameters

Blood parameters such as RBC, WBC, Hb, Hct, PLT, MCV, MCH and MCHC were shown in Table - 3. Similarly, there were no statistical differences between the groups.

Table – 3. Comparison of the hematological parameters of dogs (before 3 minutes, first incision) and immediately after the (last stitch, 3 minutes) ovariohysterectomy.

Grou ps	WBC (x103/mm 3)	RBC (x106/mm 3)	PLT (L)	Hb (gr/dl)	Hct (%)	MCV (µ3)	MCH (pg)	MCHC (%)
Contr ol	10.2 ± 2.3	7.12 ± 1.3	314.30 ±6.9	14.95±1 .2	40.53±2 .2	64.73±1 .6	23.92±0 .9	32.95±2 .3
Sufi	10.5 ± 3.9	7.71 ± 2.3	312.31±6 .7	15.12±1 .0	40.36±2 .3	64.10±1 .4	23.92±1 .6	35.26±2 .3
Heavy metal	9.8 ± 3.4	7.65 ± 2.2	378.15±9 .4	14.93±1 .8	40.18±2 .6	65.71±2 .6	24.68±2 .2	34.85±3 .4

p > 0,05

First wake up anesthesia period

First wake up anesthesia period in Heavy Metal Music-treated group was shorter than control and Sufi Music-treated groups ($p < 0.01$). Sufi music-treated group had longest first wake up anesthesia period than other groups, But there were no differences in groups (Table - 4).

Table – 4. First wake up anesthesia period of dogs (before 3 min, first incision) and immediately after the (last stitch, 3 min) ovariohysterectomy).

Groups	Min
Heavy metal	33.38± 1.43b
Sufi	40, 88± 0,64a
Control	37,88± 1,61a

Means with at least different superscript in a column and row do differ significantly ($p < 0.01$).

DISCUSSION

The time is very important factor for complete the operations safe and correctly in veterinary practice. In some cases, animals can be waked up from anesthesia process in a short time. Dissociative anesthetics are widely used for general anesthesia process where inhalation anesthesia cannot be performed in many veterinary practices. In some operations, an additional dose of Ketamine administration may require for extending anesthesia period (16). An additional dose of Ketamine can cause intraoperative problems such as hypotension, arrhythmia, respiratory depression, pain and anxiety in animals (16, 17). Physiological (sensory, hormone and physical-motor reactions such as changes in the metabolism, release of adrenaline, regulation of the breathing rate, changes in arterial blood pressure, reduction of fatigue and muscle tone) and psychological (safe, effective, time efficient and enjoyable) effects of listening to music have been determined in human studies. The previous animal studies also showed that music may affect animals similarly to humans (2, 20).

Although, it has been reported the effect of music types on pre, intra and also postoperative comfort in human (6, 21) and animal (2, 22) studies, there is no accessible data about duration of first wake up anesthesia period, physiological and hematological changes in dogs. In human studies, listening to music was found ineffective on heart rate and blood pressure values (10, 20, 23, 24). Similarly, it was not found statistical changes in heart rate, blood pressure, body temperature, saturation of oxygen and respiratory rate values among the groups in present study (Table 2). Nonetheless, in some human studies, oxygen saturation was increased statistically depending on the music interventions were reported (25, 26). Choice of music or rhythms could affect the animals unlike human. On the other hand, it was reported that listening to Indian Classical Music for about 22 min were significantly reduced systolic and diastolic blood pressure, pulse rate and respiratory rate of asymptomatic individuals (27). These results may be related to changing the types of music and duration of music intervention.

Although, the peripheral WBC (Total leucocyte) counts were increased depending on acute noise stress was reported in human study (28), It was not found changes in TCL counts in present study. Presented study, neither Sufi nor Heavy Metal Music changed stress and immunological conditions in dogs. Besides, RBC, Hb, Hct, PLT, MCV, MCH and MCHC values were not changed statistically comparing with before and after the ovariohysterectomy related to music interventions in present study (Table 3). This result was supported by another human study (28). Our results were firstly reported in animals which were exposed to ovariohysterectomy under the using ketamine HCL anesthesia.

Influence of music and its types on respiratory rate and pupil diameter variations in cats under general anesthesia was evaluated by researcher (22) and results also showed that use of certain music types in the surgical area may contribute to a decrease in the anesthetics dose required, reducing undesirable side effects of anesthetic agents. In human studies, effects of perioperative music on sedation in patients also showed that music had sedative effects in patients who were suffered gynecological surgery (29). Besides, it was reported that listening to music leads to higher sedation scores in sedated humans (30). The effect of music on procedure time and sedation during colonoscopy were investigated that listening to music is effective in reducing procedure time and amount of sedation during colonoscopy in human (31). According to the studies, listening to music during local urological procedures was effective in reducing patients' anxiety, pain and sedative drug dose and this simple and cost-effective method can be used to support patients' sedation during local procedures (32). On the other hand, impact of intraoperative music therapy on the anesthetic requirement and stress response in laparoscopic surgeries under general anesthesia was evaluated and results could not be demonstrated the beneficial effects of intraoperative music as an non pharmacological intervention unlike our study (33). It was also evaluated the effects of music on stress and anesthetic consumption in surgery operations and results of the study showed that music had not effective for this area (34). In present study, first wake up anesthesia period was detected statistically ($p < 0.01$) shorter in Heavy Metal Music intervened group than Sufi and control groups. Besides, using of additional Ketamine HCL was higher in heavy metal group than the other groups. It was found that heavy metal music has a detrimental effect on first wake up anesthesia period for dogs in present study. In addition, duration of first wake up anesthesia period was not effected from Sufi music applications ($p > 0.05$) when comparing with the control group in present study (Table - 4). It also determined that Sufi music has not a favourable effect on duration of first wake up anesthesia period and also total anesthetic amount in dogs. These results were also firstly reported in dogs which were exposed to ovariohysterectomy under Ketamine HCL anesthesia. In conclusion, neither Sufi nor Heavy metal music applications were found effective on extend the first wake up anesthesia period in dogs.

CONCLUSIONS

In conclusion, the data showed that further studies are needed about the effects of music on these and other different parameters in animal species.

Ethical approval

All experimental procedures were approved by the Ethical committee of the University of Manas (2016-08/1), Bishkek, Kyrgyzstan.

Declaration of interest

The authors declare no conflict of interest. The authors alone are responsible for the content and writing of the paper.

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