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USING VIDEO RECORDINGS OF ANIMAL EXPERIMENTS FOR TEACHING PHYSIOLOGY

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ABSTRACT

Aim: The aim of this study was to compare cardiac physiology practices which were applied on the frog heart with watching the video of the same experiment by the first year medical students.

Methods: Students (n=217) observed an experimental study on frog heart and they prepared an observation report at the end of this practice. Other students (n=196) watched the video recordings of the same experiment. They also prepared an observation report. Grades were given from the reports. All students were answered a Likert type questionnaire about what they learnt one year after the practice. The answers were compared in two groups by Mann Whitney U test and Chi-squire test.

Results: No difference was determined between the answers about to understand the cardiac function (p=0.980), the effects of ions on cardiac function (p=0.709), knowledge about pace makers and conduction system of the heart (p=0,474) in two groups. Grades were higher for the students who were watched the video recordings than the students who were observed the animal study (88,4 and 84,7 out of 100, respectively, p<0,01).

Conclusions: The present study demonstrated that watching video recordings are suitable alternative instead of using living animals in teaching cardiac physiology.

Key words: Medical education, Heart, Replacement

INTRODUCTION

Using animals for medical education can causes ecological and ethical problems therefore it is a controversial issue. Replacement, Refinement and Reduction (the 3Rs) principles have been revealed by William Russell and Rex L. Burch in 1959. These rules suggest replacing or decrease the use of animals and improve animal welfare. The 3Rs are applicable for medical education in addition to scientific studies (1-4). Therefore it has been shown recently that the number of living animals for education has been decreased in many of the country (2, 5). However some experimental studies on neuromuscular and cardiac physiology are continue to do in medical faculties or veterinary faculties. Therefore many frogs or rats are continued to use for education every year (6).

Using living animals can cause undesirable psychological effects including desensitization or feeling disappointed. Controversial results can be observed during the experiments because of the difficulties of standardization. Additionally, experimental studies can be painful for the animals and they can apply only ones in the laboratory without repeated (7).

When considering the technological progress, to looking for new education methods for medical education are inevitable. New technologies give an opportunity for improving personal skills for acquisition and storage of knowledge. Three dimensional models are used for teaching the dissections (8), following the video images can be useful for understanding physiological experiments. These methods are retractable and watching again, reduces the using animals in

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laboratory, they are suitable for watching outside of the laboratory, they prevents the fear of failure, therefore they can be prefer (7, 9-12). It has been reported that complicated anatomical structure and physiologic functions are understand easily for using technological tools (8). It has been known that alternative methods have been applied in medical schools due to the student protests (7, 13, 14).

The aim of this study was to compare the opinions of the students which were given classical education (CE) with using living frogs for learning cardiac physiology or alternative education (AE) which were applied with watching the video of the same practice.

MATERIAL METHODS

First year students of Trakya University Medical Faculty were divided in two groups as CE group who observed an experimental study on cardiac physiology using living frogs (n=217) and AE group includes the students (n=196) who watched the video recordings of the same experiments. A presentation was given about why the animals used for scientific studies, what was the 3Rs principles, what was the aim of this practice just before the application. Experiments were done by certificated members of department of physiology. Students were observed the experiment or the video recording of the experiment in two groups. All students prepared an observation report at the end of this practice. Grades were given from the reports. Additionally, all students were answered a Likert type questionnaire after one year of the practice. The questionnaire contained nine questions about what they learnt the practice one year before. The answers which approved and certainly approved were combined. Similarly, the answers which not approved and certainly not approved were combined. Three groups as approved, not sure and not approved were compered in two groups by Mann Whitney U test and Chi-squire test. The values $p<0,05$ were accepted as significant.

RESULTS

No difference was determined between the answers about to understand the cardiac function (p=0.980) **(Figure 1)**, the effects of ions on cardiac function (p=0.709) **(Figure 2)**, knowledge about conduction system of the heart (p=0,474) **(Figure 3)** in two groups. Although, 59,2% of the students in AE group approved that they got information on experimental and animal studies, the ratio of students who thought they got information was 75,7% in CE group (p=0,001). A difference was found in two group in terms of preparing an observation report. 49,5% of the students approved that they were became skill for preparing an observation report whereas 67,2% of the CE group were approved this question (p=0.001). Whereas 58,2% of the students who were approved that adequate to observe the experiments as video recordings in AE group, 40,7% of the students were approved the same question (p=0.03) **(Figure 4).** The question about the point of view on how using animals in experimental studies, no difference was found in AE and CE groups (68,8% vs 68,9% respectively, p=0.980). The grade of practice was higher in AE group than the CE group (88,4 vs 84,7 out of 100 in two group respectively, p=0.01; **Figure 5**).

DISCUSSION

The results of this study demonstrated that video recordings of the experiments which were applied using frogs are effective as the practices which were made observing the same experiments using living animals in first year medical education. Thus it has been consider that video recordings can be used as an alternative method to the animal experiments in medical education. Similar results of this study have been demonstrated that alternative methods are preferable because of reduces the using animals in laboratories; they were suitable for watching outside of the laboratory, and they decreases the fear of failure in the experiment (7, 9-12).

It has been reported that complicated anatomical structure and physiologic functions can learn easily with using technological tools (8). On the other hand, it has been known that alternative methods have been applied in medical schools due to the student protests (7, 13, 14). A recent study demonstrated that alternative method have been preferred by students instead of using animals for medical education (8). Some of the studies demonstrated no difference between using the traditional dissections and technological tolls for the performance in terms of the anatomical dissections (15-19). We could not found significant difference in respect of opinions about understanding the terms of cardiac function, effects of ions on cardiac function, features of conduction system of the heart in AE and CE groups in the present study.

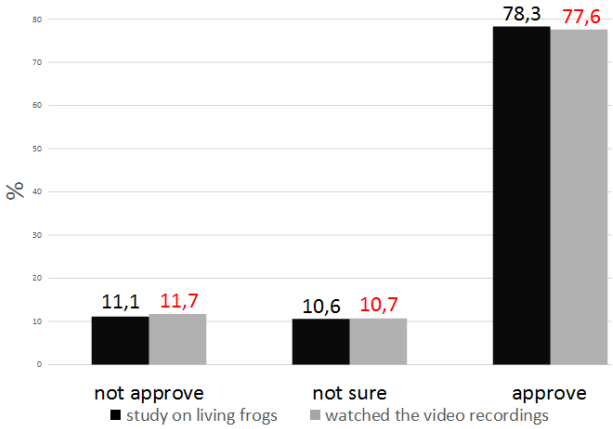

Figure 1. Understanding the terms of cardiac function.

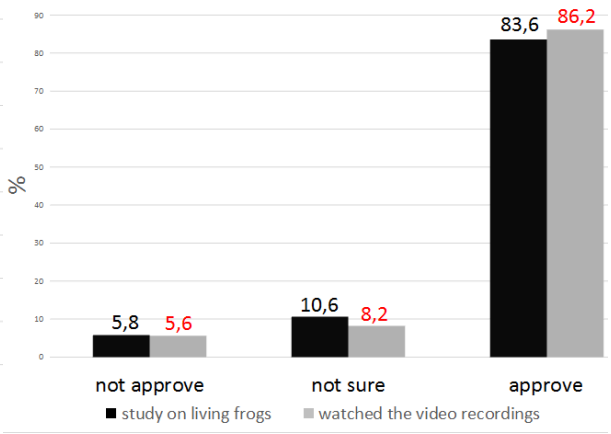

Figure 2. Understanding the terms of the effects of ions on cardiac function.

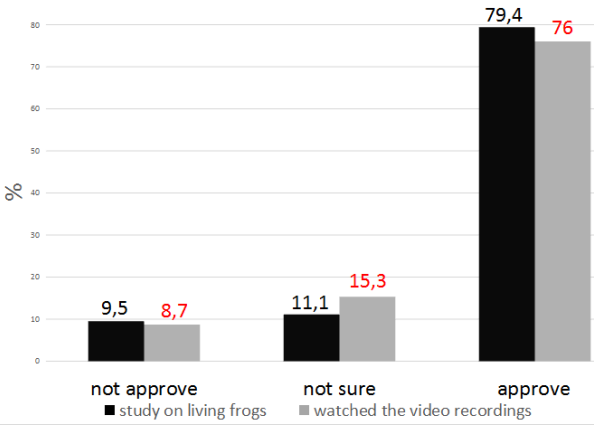

Figure 3. Understanding the terms of pace makers and conduction system of the heart.

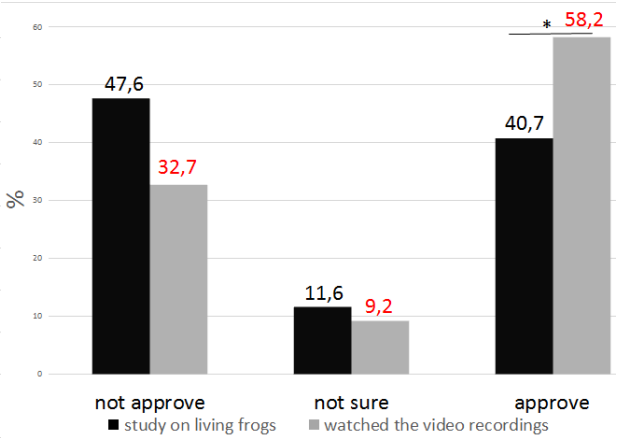

Figure 4. The question about it was enough to watch the video for this practice,. (* shows p=0.01 between two groups).

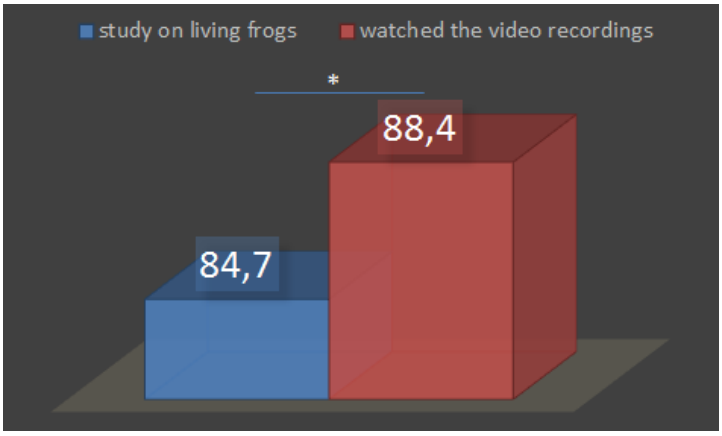

Figure 5. Avarage grades of the groups, (* shows p=0.01 between two groups).

A research of Marszalek and Lockard reported no difference of the grades of the practices for learning anatomy dissections using animals and videos (20). On the other hand, higher grades have been reported in the studies which were used alternative methods instead of the studies

which were done using living animals, similar to our study (21-23). Grades were given by done a structured evaluation from the observation reports by two teachers in this study. It has been shown that the mean of the grades was higher in the AE group than the CE group. It has been shown that performances of the students using alternative methods were higher than the students using classical methods (24-26). We could not evaluate performances of the students in this study because of they have not certificated for animal studies. We only evaluated their observation report and higher grades could be accepting an identifier for their success. However, percent of the students on understanding the experimental process and becoming skilful at experiments were higher in CE group than AE group. Some of the studies demonstrated that using living animals in the experiments were superior to the alternative methods without using animals because of enhances tactile sensing (27-29). Tactile simulations could be helpful for understanding cardiac physiology more effectively.

Animals are still used in medical education in many universities. Although difficulties the certain numbers of animals which were used in scientific research and education are 17-70 million approximately (30). It has been known that %1 of the animals was used for medical education despite the number continue to decrease in the countries which were support at the 3R principle extensively (2, 5). 20 frogs each year had been used for cardiac physiology education until two years ago. No animal studies were applied for medical education for two years.

In summary, the results of this study demonstrated alternative methods could be helpful for achieving the objectives on medical education without using living animals.

REFERENCES

1. Russell, W.M.S. and Burch, R.L. The principles of humane experimental technique. http://altweb.jhsph.edu/pubs/books/humane_exp/het-toc, 1959.
2. Akbarsha, M.A., Zeeshan, M. and Meenakumari, K.J., Alternatives to animals in education, research, and risk assessment: an overview with special reference to Indian context. *Toxicity Testing and Medicine* 2(1):5-19, 2013.
3. Deguchi, B.G.F., Molento, C.F.M. and de Souza, C.E.P., The perception of students on the use of animals in higher education at the Federal University of Parana, Southern Brazil. *ATLA*, 40:83-90, 2012.
4. Goldberg, A.M., The principles of humane experimental technique: is it relevant today? *Altex*, 27:25-7, 2010.
5. Greeve, P.D., Leeuw, W.D. and Zutphen, B.F.M., Trends in animal use and animal alternatives. *ATLA*, 32(1):13-9, 2004.
6. Altuğ, T. Animal experiments ethics. Periodical Publishing in Health Sciences, 7th National Symposium Proceedings. ULAKBİM TUBİTAK: http://uvt.ulakbim.gov.tr/tip/sempozyum7/bildiri.uhtml; 2009. (Cited: 10.05.2014).
7. Valk, J.V.D., Animal use and alternative in education. *AATEX*, 12(1):1-6, 2006.
8. Gültiken, M.E., Plastic models: an alternative for veterinary anatomy education? *Animal Health, Prod. and Hyg.*, 1:53-8, 2012.
9. Gruber, F.P. and Dewhurst, D.G., Alternatives to animal experimentation in biomedical education. *ALTEX*, 21(1/04):33-48, 2004.
10. Knight, A., The potential of humane teaching methods within veterinary and other biomedical education *Altex Proceedings*, 1(12):365-75, 2012.
11. Hakkinen, P.J. and Green, D.K., Alternatives to animal testing: information resources via the internet and world wide web. *Toxicology*, 173(1-2):3-11, 2002.
12. Knight, A., Humane teaching methods in veterinary education. *Veterinary Review*, 126:16-21, 2007.
13. Balcombe, J. The Use Of In Animals higher education problems, alternatıves, recommendatıons. Washington: The Humane Society Press, p. 79, 2000.
14. Martinseng, S. and Jukes, N., Towards a humane veterinary education. *J Veterinary Med Educ*, 32(4):454-60, 2005.
15. Dewhurst, D.G., Hardcastle, J., Hardcastle, P.T. and Stuart, E., Comparison of a computer simulation program and a traditional laboratory practical class for teaching the principles

of intestinal absorption. *Am J Physiol*, 267(3):95-104, 1994.
16. Guy, J.F. and Frisby, A.J., Using interactive videodiscs to teach gross anatomy to undergraduates at the Ohio State University. *Acad Med*, 67(2):132-3, 1992.
17. Jones, N.A., Olafson, R.P. and Sutin, J., Evaluation of a gross anatomy program without dissection. *J Med Educ*, 53(3):198-205, 1978.
18. Kinzie, M.B., Strauss, I. and Foss, J., The effects of an interactive dissection simulation on the performance and achievement of high school biology students. *J of Research in Science Teaching*, 30(8):989-1000, 1993.
19. Leathard, H.L. and Dewhurst, D.G., Comparison of the cost effectiveness of a computer-assisted learning program with a tutored demonstration to teach intestinal motility to medical students. *Association for Learning Technology J*, 30(1):118-25, 1995.
20. Marszalek, C.S. and Lockard, J., Which way to jump: conventional frog dissection, cd-tutorial, or microworid? *In: Proceedings of selected research and development papers presented at the national convention of the association for educational communications and technology, Houston, Texas*, Retrieved March 19, 2014 from ERIC database. 1-16, 1999.
21. Griffon, D.J., Cronin, P., Kirby, B. and Cottrell, D.F., Evaluation of a hemostasis model for teaching ovariohysterectomy in veterinary surgery. *Vet Surg*, 29(4):309-16, 2000.
22. Lilienfield, L.S. and Broering, N.C., Computers as teachers: learning from animations. *Am J Physiol*, 266(3):47-54, 1994.
23. Predavec, M., Evaluation of E-Rat, a computer-based rat dissection, in terms of student learning outcomes. *J of Biological Educ*, 35(2):75-80, 2001.
24. Youngblut, C. Use of multimedia technology to provide solutions to existing curriculum problems: virtual frog dissection. George Mason University; 2001.
25. Samsel, R.W., Schmidt, G.A., Hall, J.B., Wood, L.D., Shroff, S.G. and Schumacker, P.T., Cardiovascular physiology teaching: computer simulations vs. animal demonstrations. *Am J Physiol*, 266(3):36-46, 1994.
26. Abutarbush, S.M., Naylor, J.M., Parchoma, G., D'Eon, M., Petrie, L. and Carruthers, T., Evaluation of traditional instruction versus a self-learning computer module in teaching veterinary students how to pass a nasogastric tube in the horse. *J Vet Med Educ*, 33(3):447-54, 2006.
27. Cross, T.R. and Cross, V.E., Scalpel or mouse? a statistical comparison of real & virtual frog dissections. *The American Biology Teacher*, 66(6):409-11, 2004.
28. Paulson, R.V. The Effects of computer animated dissection versus preserved animal dissection on the student achievement in a high school biology class. Milligan College; 2001.
29. Smeak, D.D., Hill, L.N., Beck, M.L., Shaffer, C.A. and Birchard, S.J., Evaluation of an autotutorial-simulator program for instruction of hollow organ closure. *Vet Surg*, 23(6):519-28, 1994.
30. Liebsch, M., Grune, B., Seiler, A., Butzke, D., Oelgeschlager, M., Pirow, R., Adler, S., Riebeling, C. and Luch, A., Alternatives to animal testing: current status and future perspectives. *Arch Toxicol*, 85(8):841-58, 2011.