

## “Non-Trivial Pursuit of Physiology”

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**Zakaryan, Vazgen, Richard Bliss, and Narine Sarvazyan.** “Non-Trivial Pursuit of Physiology.” *Adv Physiol Educ* 29: 11–14, 2005; doi:10.1152/advan.00031.2004.—This article describes a novel way to conduct a review session that combines interactivity, team learning, and peer-to-peer instruction. It uses the format of the familiar game “Trivial Pursuit.” To facilitate the game process and to encourage its use by others, we have developed custom software. It allows an instructor to run the game from the podium and to input questions/answers for a particular block or other area to be reviewed. In addition to the software itself, the online supplement (<http://advan.physiology.org/cgi/content/full/00031.2004/DC1>) contains 100 sample questions and answers written for the cardiovascular physiology review session. The developed game format and its software add to the arsenal of educational tools that can be used to enrich students’ learning experiences.

interactive review session; team learning; peer-peer instruction; game format

TEACHING OF BASIC SCIENCE COURSES for medical school education can be significantly enriched by introducing interactive approaches. Team learning and active peer-to-peer instruction also have been strongly encouraged by the National Board for Medical Examiners. Our paper describes a review session that combines all three elements: interactivity, team learning, and peer-to-peer instruction. It uses the format of the familiar game “Trivial Pursuit.” Use of a modified game format for the physiology review sessions has been described in the past (1–3). Specifically, both “Who wants to be Physician?” (2) and “Physiology Survivor” (1) have proven to be successful tools for reviewing respiratory physiology in medical school settings. These articles (1, 2) motivated us to develop another type of game that can also be used to conduct review sessions interactively. To assist the use of this game format by others, we developed custom software. The software allows an instructor to run the game from the podium and input questions and answers for a particular block or other areas to be reviewed. In addition to the game itself, the online supplement (<http://advan.physiology.org/cgi/content/full/00031.2004/DC1>) also contains 100 sample questions in six categories: cardiac cycle, cardiac output and venous return, electrophysiology, hemodynamics, microcirculation, and regulation. The game was conducted in February of 2004 as a part of the first-year Medical Physiology course at the Texas Tech University School of Medicine.

### METHODS AND RESULTS

#### Materials

A large room or lecture hall was equipped with a computer projector, a laptop computer with the software, a set of buzzers, and

prizes (optional). We used a set of buzzers from [www.scholastic.com](http://www.scholastic.com), which cost a total of \$230 (US) for four buzzers. Additional cords that link the buzzers can be purchased if they are to be positioned further than three feet apart. Other sources of similar game equipment can be found online at a variety of scholastic sites.

#### Rules of the Game

*Students are divided into teams.* There are six categories (each of which has a corresponding color) from which questions can be drawn. Choice of color is accomplished by random spinning of the wheel that is a part of the game software (Fig. 1). A question from the corresponding category is then displayed (Fig. 2). The teams are allowed to discuss the question, and when they think they have the right answer, they buzz in. The person who answers the question is required to provide an answer immediately to avoid “buzz first, think later” strategy. The instructor clicks on the answer. If it is correct, its background turns red, if it is wrong, the background turns dark gray (Fig. 3).

*If the team gets the question right, they get their box of that color filled in.* If they get it wrong, then the other three teams can try to answer the question. The correct answer can be either discussed by the instructor or shown on a screen.

*If a team gets a question wrong, they are penalized and cannot participate in answering the following question.* So, for example, if team I misses the first question, then they have to sit out on the second question and can resume play on the third.

*If three teams miss a question (so that there is only one team and the correct answer left) the last team will get the box only if they can explain why the last answer is the correct answer.* If they cannot explain the answer, it will be considered wrong and no box will be awarded. All four teams will be allowed to answer the next question whether or not a box was awarded.

*Once a team gets five of the six boxes filled, any of the teams can then choose the next category if they get a question right.* Example: team I only needs one more box and they get question 10 right. team I can choose any category for question 11 (all teams can participate, however). If team II gets question 11 right, team II can now choose the next category (even if they only have one box filled).

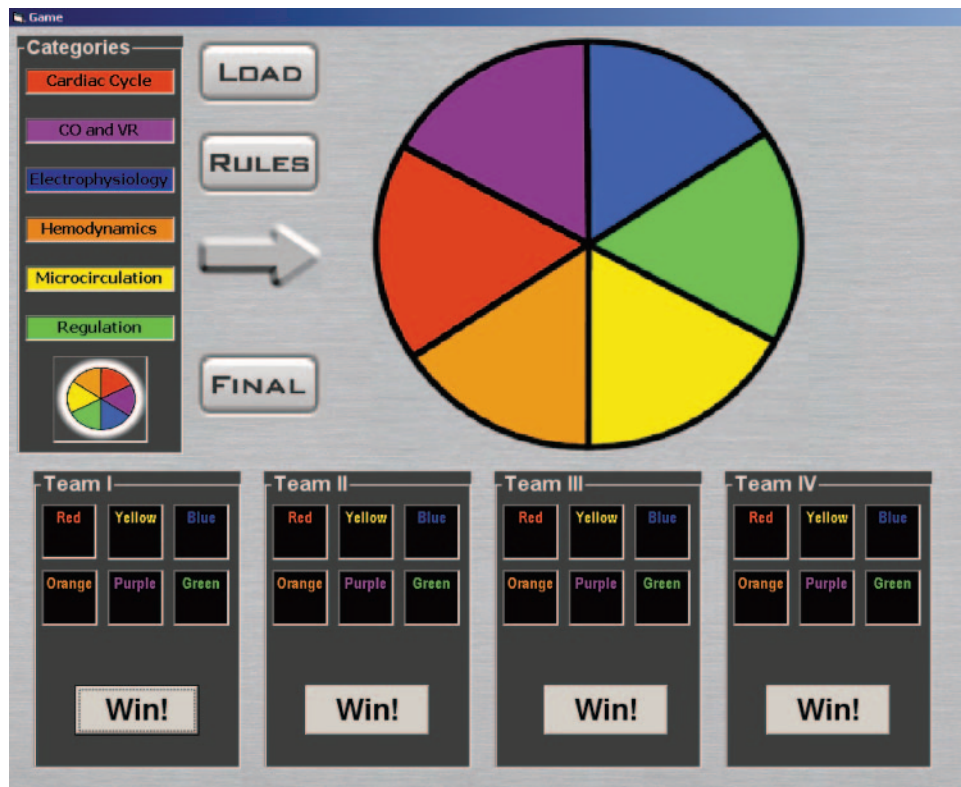
*Once a team has all six pieces, they are asked a final question, the color of which is determined randomly by spinning the wheel.* This question is free response, and only that team can answer the question (Fig. 4). If they answer the final question correctly, they win. If not, they lose one of their pieces, the color of which is determined randomly by spinning the wheel, and then the game continues.

#### Custom Software

The software for the game was written by Vazgen Zakaryan (undergraduate student, Texas Tech University, Mathematics Department) in Microsoft Visual Basic 6.0 using global variables declared in a separate module. It is compatible with Windows 98 or later, including Windows 2000 and XP. The software is run by the instructor by clicking the game wheel and corresponding buttons on the main page. It also enables the instructor to correct the score if needed. Input of questions and answers can be done via a .txt file. The instructor can enter any number of questions into each category, followed by the line “No more questions in this category.” When the instructor clicks on a

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Fig. 1. Main game window (see online supplement for game software: <http://advan.physiology.org/cgi/content/full/00031.2004/DC1>), contains the review categories (left), buttons for questions and answers (center), spinning wheel (right), and team points (bottom). Each of these buttons can be engaged by a mouse click.

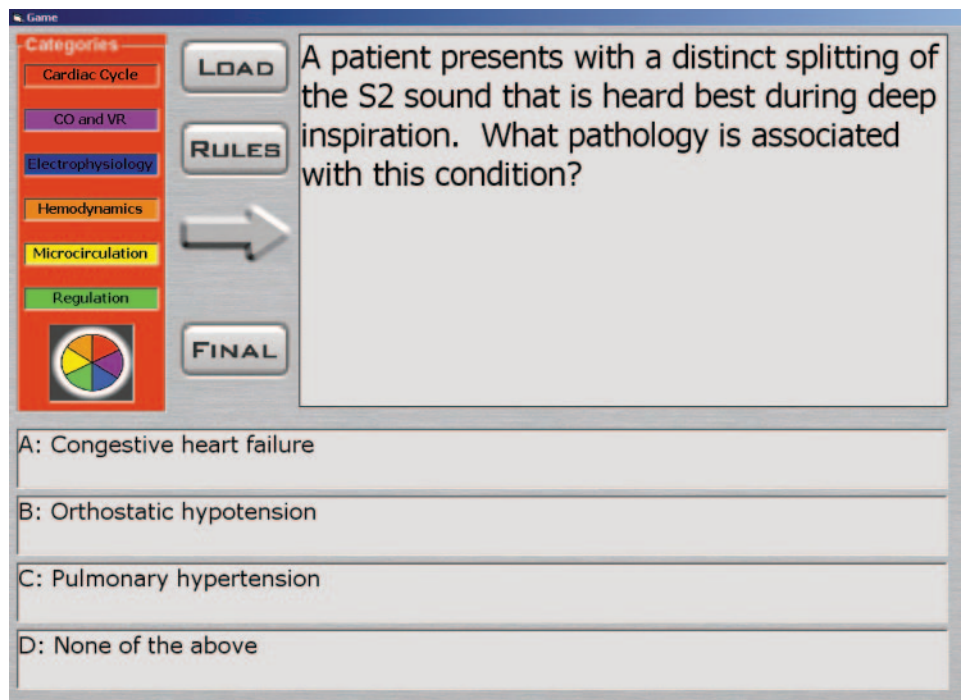


category, the software retrieves stored questions sequentially, i.e., 1, 2, 3., until the screen with “no more questions in this category” appears. Therefore, if so desired, the instructor can make the difficulty of questions increase as the game progresses. A manual for the software is included in the online supplement (<http://advan.physiology.org/cgi/content/full/00031.2004/DC1>).

Use of custom software gave us three advantages over earlier, PowerPoint-based games (3). First, an element of excitement is

associated with the random assignment of category by spinning the wheel. Second, custom software gives the capability to automatically score and display all teams at once, making games more competitive and fun. Finally, the software gives the instructor full control over the pace of the game and its scoring by presenting all the information on one screen. Although it may take a bit more time to input questions and answers, it appears to be a good alternative to simpler game formats.

Fig. 2. Question frame with an example of a text-based question. Multiple choice answers are displayed, bottom. When a team suggests an answer, the instructor clicks on the choice. If answer is correct, its background turns red; if it is not correct, the background turns gray. A return to the main game window is achieved by clicking on the small wheel picture.



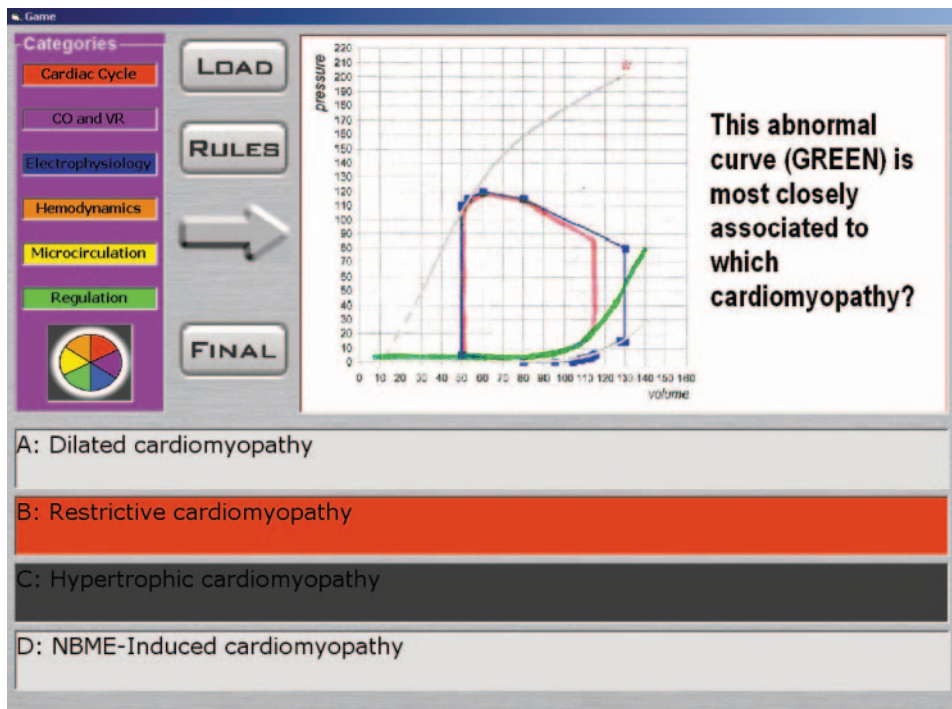


Fig. 3. Question frame with an example of an image-based question.

#### Review Session Format

The game format and the developed software assume that the number of participating teams ranges from two to four. The number of students in each team is arbitrary. The optimal size, however, appears to be 6–10 on each team, which enables discussion between students. If the class is excessively large, students can be divided into four teams with 6–10 active members representing a team at any given time. The active members of each team will then rotate after five questions. Alternatively, two or more rounds of the game can be

played. The latter option requires different sets of questions and answers to be created to avoid repeating the same questions. Notably, after the review session, the software and created database of questions can be given to students to allow for individual review.

For the final questions, we wrote questions that required oral presentation instead of multiple choice answers. After a short discussion, a student from the team presented the answer using a chalkboard. A panel of judges, formed by the faculty who taught that particular session, then voted whether the team answered the final question

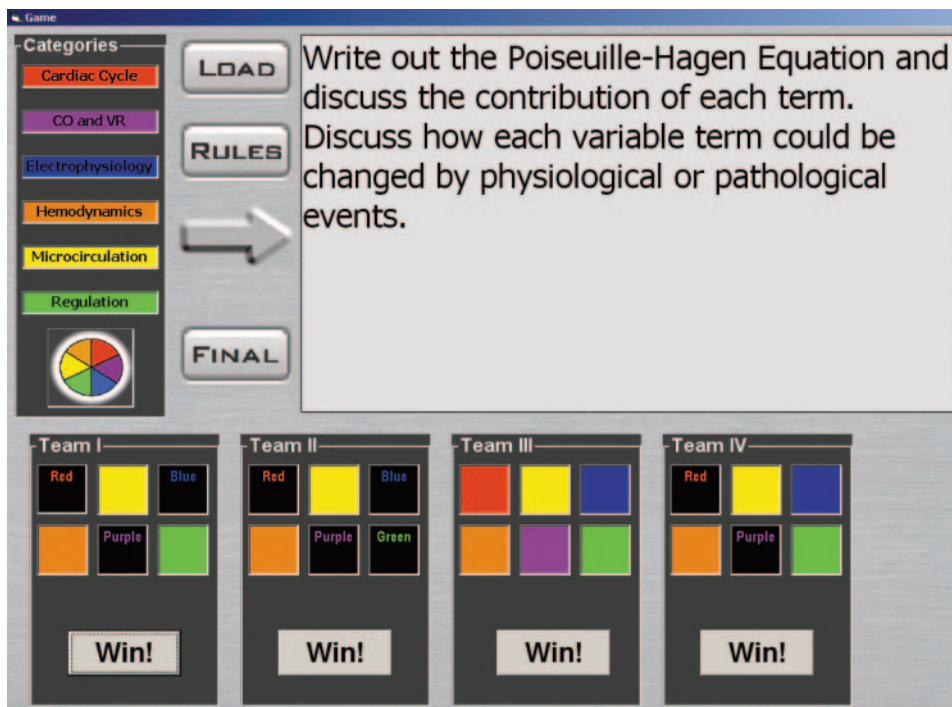


Fig. 4. Question frame with an example of a final question. It is asked when a team (*team III* in this case) collects all 6 colors in the multiple-answer categories.

correctly and therefore won the game. This element of the game provided testing of the material in a different format and gave more weight to the outcome of the final questions.

Upon completion of the game, all members of the winning team were given an award certificate (a template is included in the online supplement: <http://advan.physiology.org/cgi/content/full/00031.2004/DC1>). The atmosphere of the game was further enlivened by humorous awards to the students who exhibited the best answers or were the most active.

## DISCUSSION

"Non-Trivial Pursuit of Physiology" was developed to further enhance a concept of interactive review sessions, which was explored in the educational games "Who wants to be a Physician?" (2) and "Survivor" (1). The game was developed for and can be used in conjunction with any educational material. Test questions were set up on the basis of the first-year medical school curriculum for cardiovascular physiology. The game was conducted at the end of the first block of the medical physiology course at the Texas Tech University School of Medicine and covered the cardiovascular physiology section. Specifically, the six categories included were: cardiac cycle, cardiac output and venous return, electrophysiology, hemodynamics, microcirculation, and regulation.

Most review sessions consist of a brief summary of the material followed by a question and answer period. Although they are useful, presentation of the material is usually didactic and does not involve active learning. In contrast, game-like formats, including "Non-Trivial Pursuit of Physiology," allow students not only to review the material but also to interact, discuss, and collaborate with each other. Such collaborative learning is an important experience that promotes the development of cooperative skills and can be useful for the participants' future employment.

A high level of participation (over 75% of the registered class) indicated a high interest in this type of review session. Most of the feedback was positive, with students commenting on the enjoyable way to review and learn the material. It included comments such as "it was fun, and looking around the room no one was sleeping, rather they were enjoying the game and learning at the same time"; "many different sections covered by many different professors were combined into one session, along with questions to see how many basic concepts we understood"; "it was lots of fun and at the same time a great chance to learn new things, reveal any areas of weakness, and many more things. . ."; and "the amount of material covered in a short amount of time was beneficial. I appreciated the extra effort that was put into the review session. It made it fun."

Suggestions for further improvement were largely related to the fact that the game questions were somewhat different from the questions given during the block exam. Indeed, questions for this particular session were written by Richard Bliss (MD/PhD student, coauthor of this paper), and questions for the block exam were written by several faculty members involved in teaching of the cardiovascular section. This concern can be

easily alleviated if the game and exam questions are written by the same person or team of instructors. Another common critique was insufficient time to process a question and its multiple-choice answers. Certainly, the use of buzzers in competitive settings substantially speeds up the game, which allows one to review a lot of the material in a short period of time. The downside of this format, however, is that it may be too fast for some students to follow. The instructor therefore is encouraged to monitor audience reaction in order to select an optimal pace for the game.

We also want to comment on the involvement of graduate or senior students as game moderators. We believe that such an experience will significantly enrich their knowledge of physiology and help sharpen their teaching skills. A lot can be learned from the discussions of the student-made questions with different faculty members. Due to the significant effort required for preparation of a new set of questions, such an assignment can be counted toward a rotation or be part of teaching curriculum. Because of its interactive, game-like format, this experience indeed is a good way to excite young people about novel ways to learn physiology and learning in general.

Overall, both students and instructors (present during the game as a panel of judges) considered the game format a new and fun way of reviewing course material and enjoyed its interactive component. Development of the custom software provided a convenient way to control the game from the podium and an added element of excitement by having a random selection of question category. Importantly, the developed game format promoted an entire class to be involved in interactive thinking and discussion of each question during the 2-h class. On the basis of the positive feedback, we believe that this new format provides a good alternative way to conduct a review session.

In summary, this report article presents a new game-like format of the review session and its custom-designed software. It adds to the arsenal of educational tools that can be used to enrich students' learning experiences.

## ACKNOWLEDGMENTS

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