

Poster and model competition: a novel interest-generating teaching tool in the subject of pharmacology

Lois James Samuel*, Laveena V. Bandodkar, Padmanabh V. Rataboli

Department of Pharmacology,
Goa Medical College,
Bambolim, Goa, India

Received: 18 May 2014

Accepted: 10 June 2014

***Correspondence to:**

Dr. Lois James Samuel,
Email: loisjames@rediffmail.com

© 2014 Samuel LJ et al.

This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: The objective of this study was to provide an extrinsic motivation for learning and allow it to translate into intrinsic motivation during the activity. To generate an interest and to have a better understanding of pharmacology by preparing models and posters.

Methods: The present study was carried out among the second year MBBS students. The topic selected was “pharmacotherapy of diabetes mellitus.” A formal announcement was made 30 days in advance. Didactic lectures were taken as per schedule. Ninety-seven students were divided into 18 groups of 5-6 student's each. Nine groups were allotted to prepare models and nine were allotted to prepare posters. On the assigned day student's presented their posters and models with enthusiasm. The best three posters and three models were awarded. Feedback forms in the form of questionnaire were given to the students. The students had to grade the answers: 1: little help, 5: extremely helpful. 1-2: low score; 3: medium score; 4,5: high score.

Results: Chi-square test was applied to all answers except eighth. The answers showed Chi-square value more than 9.21 and $p < 0.01$, which is considered statistically significant. As for the eighth answer, 77.7% students scored it 4-5 (high score). The sample size for 1-2 (low score) was only 3: so Chi-square test was not applicable.

Conclusions: The poster model competition did generate an interest in the topic. The students had a new avenue to express themselves and in the process gain more knowledge in an enjoyable manner. Learning is facilitated when students themselves play an important role in the learning process. Poster-model competition can be incorporated as a teaching-learning tool to encourage and motivate students who lack intrinsic motivation.

Keywords: Poster presentation, Models, Interest, Teaching-learning, Motivation

INTRODUCTION

Pharmacology is undoubtedly the backbone of rational therapeutics,¹ but is a vast and volatile subject. Consequently, didactic lectures do not always suffice to make a student of pharmacology grasp the fundamental concepts and the finer nuances of the subject. During the traditional lectures, the attention span can lapse after 10-15 mins.² As a result, the students will have little interest or motivation to learn it. Consequently, teachers of pharmacology are resorting to novel methods and modifications in their teaching practices, other than the traditional, didactic classroom lectures, which could include bedside teaching, seminars, role-play, and so on.³

Poster presentation in academics has been used as a method of transmitting erudition. Poster presentation provides the

viewer with a bird's eye view of the topic. A good poster is student friendly and a succinct tool to convey knowledge to a student's.^{4,5} Posters can serve as modified mind-maps for students to get a better grasp of the subject.

Model-based learning refers to activities where students use their dexterity skills to design and build models and in the process acquire in depth understanding regarding the relevant topic. At the end of the presentation, students are filled with a sense of accomplishment and this boosts their self-confidence.³ Students also have to develop the adaptability for group work and team-spirit during this exercise.

We made an attempt to use posters and models as a modified tool of teaching by holding a poster and model competition, to find out how well it arouses and generates interest among

student's regarding a particular topic in pharmacology. The study was conducted in the Department of Pharmacology, Goa Medical College, Bambolim for second year MBBS students. The topic we selected was "pharmacotherapy of diabetes mellitus." The knowledge of anti-diabetics is of utmost importance in today's scenario considering the diabetes burden of the country.

Aims and objectives

The aim and objective of a poster or a model is to visually depict and communicate the intended message to be conveyed⁶ in an appealing, clear, and precise manner. In a class of 100-150 student's there is a wide variability in intelligence, maturity, and motivation levels. Some students have high levels of intrinsic motivation for learning and they will learn the subject irrespective of the teaching methods. The traditional method of teaching is less likely to cater to the needs of students who lack intrinsic motivation. Such students feel less inclined and less motivated to study the subject of pharmacology. They find the subject vast, volatile, and difficult to learn and moreover retain; as such they find it difficult to grasp the fundamental concepts of pharmacology. We undertook this study for the second year MBBS fourth semester students in the form of "competition of posters and models" with the following aims and objectives:

1. To provide an extrinsic motivation for learning and allow it to translate into intrinsic motivation during the activity of making the poster or building the model.
2. To generate an interest and facilitate better understanding of the subject and of its various concepts. This would help students in their clinical practice in later professional life, pharmacology being an integral part of clinical practice.
3. To develop their leadership ability to prepare and put forth a presentation and develop confidence in them thus equipping them for better patient communication and patient counseling in future. This would mold them into future leaders.
4. To understand group dynamics of learning and imbibe the team spirit through group activity, which would help the students to develop adaptability and the ability to adjust to their team members. Thus, it will help students to work in harmony and be accommodative in their approach helping them later in life to adjust and work with others.
5. To train students to be comfortable in presence of an audience thus enabling them to overcome stage fear thus improving their personality and soft skills.
6. To enable, teach and train them to enjoy studying a topic without making it a stressful experience. At a time when stress levels are quite high in our society and more so among medical students, this method could be one of the ways to reduce stress of studying, making the learning experience enjoyable in addition to being informative.
7. To provide the students an opportunity to discover,

unravel and cultivate their creative skills, thus combining creativity and learning.

METHODS

Method of the study

1. Approval was obtained from the Institutional Ethics Committee, Goa Medical College, Bambolim Goa.
2. We select the topic "pharmacotherapy of diabetes mellitus."
3. A formal announcement regarding the "poster and model competition" was made in the second MBBS class 30 days in advance.
4. Didactic classroom lectures on the topic of diabetes mellitus were taken prior to the competition as per the lecture schedule.
5. We divided the second MBBS class with strength of 97 students into 18 groups-each group consisting of 5-6 students. Nine groups were assigned a topic for preparing a model each and the remaining nine were assigned a topic each for presenting a poster.
6. Each group picked their topic for models/posters by lots reducing bias.
7. The division of topics was such that it covered the entire portion of "pharmacotherapy of diabetes mellitus." The following topics were allotted to the groups.

For poster presentation

- Group 1: History of insulin.
- Group 2: Pharmacological actions and mechanism of action of insulin.
- Group 3: Traditional and newer insulins.
- Group 4: Insulin analogs.
- Group 5: Modes of insulin delivery.
- Group 6: Insulin secretagogues (sulphonylureas and meglitinides).
- Group 7: Biguanides, thiazolidinediones, alpha-glucosidase inhibitors.
- Group 8: Newer anti-diabetics.
- Group 9: Overview of diabetes.

For model preparation

- Group 1: Bovine insulin.
 - Group 2: Porcine insulin.
 - Group 3: Human insulin.
 - Group 4: Insulin lispro.
 - Group 5: Insulin glargine.
 - Group 6: Insulin aspart.
 - Group 7: Insulin detemir.
 - Group 8: Insulin glulisine.
 - Group 9: Insulin s.c. pump.
8. On the day of the competition, the students presented the posters and described the models with great fervor, zeal, and enthusiasm.
 9. Feedback forms were given to all the students.
 10. The best three posters and the best three models were rewarded.

11. Marks were allotted to each group (marks out of 15), which were included for the internal assessment.
12. The posters and models were judged and evaluated using the following evaluation parameters.
 - Relevance of the topic.
 - Scientific and technical evidence.
 - Understanding, analysis and interpretation.
 - Neatness and attractiveness.
 - Overall effect of presentation, audience response.

Students' feedback

- i. Questionnaire:
 1. Did it help you to understand the topic?
 2. Did the group activity help you to develop the skill to work in harmony?
 3. Do you prefer group activity over individual assignments?
 4. Did the presentation increase your confidence?
 5. Do you think that such presentations will equip you for future presentations during your post-graduation?
 6. Did you enjoy the overall process of preparing and presenting the poster/model?
 7. Was the presentation of additional benefit to the didactic lectures in understanding the topic?
 8. Did it generate an interest or a fascination for the subject?
 9. Would you like such presentation in future?
 10. What are your suggestions for improvement?
- ii. Gradation of answers:

In the feedback forms, each answer was graded from points 1 (of little help) to 5 (extremely helpful). The grading was then divided into three groups of low score (1-2), medium score (3), and high score (4-5).

RESULTS

Table 1 shows outlines the grading for each answer in the feedback form.

We applied the Chi-square test to each question. All except the 8th question showed Chi-square value more than 9.21 and the $p < 0.01$. A value of $p < 0.05$ is considered as statistically significant. In the 8th question the sample size in the "low score group" was < 5 therefore the Chi-square test could not be applied.

DISCUSSION

The need for this exercise

For a student to achieve higher cognitive skills he/she needs to be an active learner as opposed to being a passive learner.² Therefore to encourage student involvement, a collaborative, associated learning would be efficacious. Knowles (1975)

supports self-directed learning and there is ample evidence that students who are proactive in active educational activities learn better than passive learners.⁷

As many students lack intrinsic motivation, they would require extrinsic motivation. The poster/model competition was a project-based learning (PBL), which would be the first step toward providing extrinsic motivation. PBL is an assignment, wherein the student is given a task to produce a final product like a poster or model.⁸ It is a meaningful and thorough approach compared with classroom teaching and learning method that is intended to engage students in active learning.⁹ Teachers all over the world have now realized that it is a student-centered learning, which provides a favorable milieu, wherein the students are motivated by personal involvement in the activity.¹⁰ They learn the concepts and grasp the difficult aspects of the subject that brings out the various abilities in a student.

Our analysis of the feedback forms puts across and confirms the views suggested by Knowles and others that active learning teaches you a lot more when compared to passive learning.

Analysis of feedback questionnaire

Question 1: Did the exercise help you to understand the topic?

Almost all the students agreed that it improved their understanding of the topic of diabetes mellitus. The conventional routine didactic lectures help the students to get a basic idea of the topic. More in-depth understanding was attained by the students, when they researched and prepared the model/poster relevant to that topic. We provided extrinsic motivation, wherein the students took up the task of making and presenting a poster or a model and in the process got catapulted into active learning. On one hand, it reinforced the various concepts already covered in the didactic lectures and on the other hand it helped them to understand some more aspects of topic not covered in the didactic lectures. The students had to think of novel creative ways to represent the ideas. They came up with beautiful and well-made, innovative models of various insulins. The models gave clarity in their understanding of concepts that were rather abstract, equipping them to fix them in their long-term memory.¹¹

Question 2: Did the group activity help you to develop skill to work in harmony?

The majority of students answered affirmatively to the above query. Such co-ordinated, joint and interactive group activity helps to foster team spirit among the students of the given group and thus they help each other to make the poster/model successful, which is their main objective and goal. Thus helping them to develop adaptability in their approach and make their nature accommodative; these soft skills are developed. These

Table 1: Question-wise scoring of answers in the feedback form.

Answer number	Scores	Numbers	Percentage	Chi-square value	p value
1	1-2 low	5	5.5	81.66	<0.01
	3 Medium	15	16.6		
	4-5 High	70	77.7		
2	1-2 Low	7	7.77	84.46	<0.01
	3 Medium	12	13.3		
	4-5 High	71	78.8		
3	1-2 Low	5	5.5	104.7	<0.01
	3 Medium	6	6.6		
	4-5 High	76	84.4		
4	1-2 Low	5	5.5	68	<0.01
	3 Medium	19	21.1		
	4-5 High	66	73.3		
5	1-2 Low	6	6.6	101.4	0.01
	3 Medium	9	10		
	4-5 High	75	83.3		
6	1-2 Low	5	5.5	115.2	<0.01
	3 Medium	7	7.77		
	4-5 High	78	86.6		
7	1-2 Low	5	5.5		
	3 Medium	12	13.3		
	4-5 High	73	81.1		
8	1-2 Low	3	3.3		
	3 Medium	17	18.8		
	4-5 High	70	77.7		
9	1-2 Low	5	5.5	93.2	<0.01
	3 Medium	12	13.3		
	4-5 High	73	81.1		

will be extremely helpful to them in future at their workplace. This is in contrast to the exam-oriented self-study, which is rather self-centered when compared to group activity.

Question 3: Do you prefer group activity over individual assignments?

To this query, 80% of students answered in the affirmative. Group activity cultivates team spirit and facilitates learning. Interaction with other students of the group is academically beneficial. Panitz (1996) opined that co-operation is a structure of interaction designed to facilitate the accomplishment of an end product or goal.² When students do not score well in viva or test they may develop maladaptive motivation pattern. Consequently, they avoid learning opportunities. In this poster/model competition they had to work in a group setting. The students who were not doing well academically did not have the fear of their inability/academic deficiency being exposed. In fact, there was a scope for a lot of interaction and group activity between academically highly motivated and academically non-motivated students.

Question 4: Did the presentation increase your confidence?

Two-third of the students agreed that the study in its own way did increase their confidence levels, one reason being it increased their knowledge of the topic; Diabetes mellitus in this case. This was because they had to do lot of research on the said topic. The in-depth study added to their confidence. In any learning process since the student knows the topic well, he/she can explain it better with knowledge and enthusiasm.⁶ This finding confirms the belief that when learners are provided a suitable occasion and prompted to apprise themselves, they would develop independence, creativity and this would boost their self-confidence.¹²

Question 5: Do you think that such presentations will equip you for future presentations during your post-graduation?

Seventy-five students (83%) said "yes" to this query. Poster presentation and pedagogy are an integral part of post-graduation (PG) curriculum. Since most students aspire to opt for PG this will serve to sensitize and train them and thus equip

them with the various basic skills required to prepare a poster/model. Poster presentation is becoming more popular day by day as a platform for disseminating knowledge.¹³ The process of preparing for poster presentation is painstaking. For a poster presentation to be successful it has to be done meticulously and thoroughly.¹⁴ This somewhat daunting task builds a level of self-confidence in the student, which is necessary for coping with challenges in their future academic endeavors.

Question 6: Did you enjoy the process of preparing and presenting the poster/model?

Seventy-eight students (86.6%) opined that it was an enjoyable exercise in addition to it being a learning experience. In the words of one student who wrote "Such presentations are really enjoyable. We really had a lot of fun doing it. A great initiative by the department of pharmacology to create an atmosphere of learning with minds fresh and paints on our fingers". Another student wrote "very nice and enjoyable." Thus, it reinforced our belief that "learning can be fun." Model preparation requires high quality of original and creative work. Students need to go beyond mere memorizing. They have to convey their ideas with clarity and making use of their dexterity skills to express the same along with practical application. These skills, aptitude and adeptness are referred to as "21st century skills" as they are required to be successful in the 21st century.¹⁵

Memorizing is usually stressful to most students. Here, in our study the students in the process of making posters/models automatically learned various facts, thus they underwent the learning process without having to endure any stress.

Posters are progressively being recognized both as a means of and as a strategy for transmitting or gaining knowledge and also as a different novel approach for learning.¹⁶ The process of preparing the poster in advance makes it enjoyable. It also helps the presenter to discuss the poster topics with colleagues and peers.^{17,18}

Question 7: Was the presentation of additional benefit to the didactic lectures in understanding the topic?

Most of the students (81%) said yes and graded it with a high score 4-5 out of five. In didactic lectures, we introduce the topic and try to give the students the basic concepts regarding the topic, thus we try to generate interest among them about the topic. Thus, poster/model competition did help to reinforce the didactic lecture teaching method and also unraveled a plethora of new interesting facts about the topic to the students. By the time, the MBBS students are in the second year they would be 18 years of age or more. Some of them would have worked hard to make it through the medical entrance exams, as a result, they may have been mentally exhausted and fatigued. They may have lost all their motivation to learn; such student's do not make any effort to learn through-out the academic year. By the time they

realize that exams are around the corner, they may not have ample time to read up the relevant portion for the exam. This may lead to failure in exams, which would lead to problems like depression, this leads to a vicious cycle, i.e. no further interest in studies → loss of confidence → low self-esteem → fear of exams → failure in exams. Forcing such students to learn is of little benefit. The only way to handle such students is to find out innovative, less stressful ways to motivate them to study from the start of the academic year. As these students are adults they need to be handled very delicately keeping some basic principles of androgogy in mind.¹² Learning is facilitated when the students themselves play an important role in the learning process.

Question 8: Did it generate interest or a fascination for the subject?

Interestingly more than two-thirds (77.7%) of students found the exercise extremely helpful in generating interest while only three student's opined that it did not help them. This is the biggest "positive" in our study, which has helped us to achieve our objective that this method of poster/model has worked in creating enthusiasm and improved learning. Poster/models make the process of learning pharmacology subject more picturesque, interesting and attractive. It created awareness about the topic amongst the students, which is positively expected to propel them to learn and understand the topic more clearly and thus encourage them to have a broader perspective of the subject of pharmacology. Models have a magical appeal. It has the power to wake up and harness the childlike spirit in all of us. A well-made model can captivate the imagination of students and make an indelible imprint on their minds. The picture will automatically fix in their minds effortlessly.¹⁹ Model making provides a place to express one's adroitness and helps one to translate a mental image or idea into physical reality. Model making gives an occasion to demonstrate their adeptness, expertise, knowledge and finesse.²⁰ Motivation and learning are mutually related. Motivation leads to learning; this in turn provides further motivation to learn more. The following step reveals and confirms that learning and motivation can be sequential products.¹²

1. To start with the learner perceives a goal. In this case, the goal was to produce a good poster or a good model.
2. In the process of achieving this goal the student undertakes certain activities like reading about the topic in detail and then prepare the poster/model.
3. The student experiences a sense of achievement when he/she prepares and then presents the poster/model.
4. This helps him/her to evaluate the learning process. He/she realizes that in the process of preparing and presenting he/she has learnt the topic.
5. This whole process kindles a spark of interest in the topic.
6. This spark helps the student to read up and learn more about the relevant topic.

Thus, the extrinsic motivation provided by teachers would be translated and transformed into intrinsic motivation, which in turn would be self-propagated.²¹ The learner undergoes a cognitive transformation, while undergoing this process. Thus we as teachers would have provided a means to the students to move on from an initial surface learning to achieve deeper learning.²²

Question 9: Would you like such presentation in the future?

Most of the students (81%) said yes, which encouraged us and reaffirmed our belief that learning should be fun. The poster presentation can become a teaching focus.¹⁵ For a student, presentation to classmates and at the other professional's forums helps in order to catalyze discussion of a wider dimension.¹⁶ An adult learner surely has the potential for original creative activity, but requires an opportunity and in addition some basic encouragement from the teachers to express it.¹²

Prospective gains from this exercise

1. Poster/model can serve as an evaluation tool to help us make an overall judgment of the student vis-a vis aptitude, originality. The student's develops various skills such as the communication skills, artistic skills, motivation, personality and their ability to co-ordinate and finish their work in time in a comparatively stress-free environment. This was a very pleasant change as opposed to their usual tests and vivas.¹⁷
2. It can act as a means to help the student to unfold and augment their capabilities thus unraveling, molding and developing their overall personality. Student's experience a pleasant a sense of achievement gained through the process of developing the poster and making the model.³
3. It also helped them work in a group in mutual harmony, amicably thus giving boost to the team spirit.
4. It can create an opportunity for intelligent and cordial student-student and student-staff interaction thus building a rapport amongst them and also between students and staff thus creating lifelong happy memories of their MBBS course which can be cherished for lifetime.¹³

CONCLUSION

The role of a teacher is of utmost importance in using modified methods of teaching.¹² A teacher should understand the whole process of educating the student's. A teacher should not merely teach; he/she should have the desire and capability to help students to learn. This intrinsic desire and potential in the teacher will help and motivate the students to learn. A teacher should realize that all the students in the class are not of equally motivated. Just one standard method of teaching will not suffice for all the students. Some students would do better when learning is linked to a fun-filled activity. Students will modify their likes and dislikes

towards learning depending on the method used. A teacher plays the key-role in the motivation-learning process by undertaking such innovative learning activities to arouse and sustain enthusiasm, inspire confidence and promote the desire to learn and perform well in academics.

Truly, "a committed study springs from a committed teacher". The true commitment of a teacher is reflected in his/her love and affection for the student's. This is an important asset and essential link in the learning process. A good teacher would want to identify those students who because of no intrinsic motivation to learn fail the exams and further develop an aversion for studies. A teacher needs to identify the capabilities of such students and channelize their abilities by motivating them.

Competition such as "poster/model" can be incorporated as a teaching-learning tool to encourage and motivate such students and in the process involve all the students in the learning process.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Tripathi KD. Introduction, routes of drug administration. *Essentials of Medical Pharmacology*. 7th Edition. Chapter 1. New Delhi: Jaypee Brothers Medical Publisher; 2013: 1.
2. Murray N. Improving the way technical skills are taught in creative studio-an exploration of student centered learning method. *Transaction*. 2012;9(2):30-58.
3. Moule P, Judd M, Girot E. The poster presentation: What value to the teaching and assessment of research in pre- and post-registration nursing courses? *Nurse Educ Today*. 1998;18(3):237-42.
4. Moneyham L, Ura D, Ellwood S, Bruno B. The poster presentation as an educational tool. *Nurse Educ*. 1996;21(4):45-7.
5. Rowe N, Ilic D. What impact do posters have on academic knowledge transfer? A pilot survey on author attitudes and experiences. *BMC Med Educ*. 2009;9:71.
6. Rowe N, Ilic D. Poster presentation - A visual medium for academic and scientific meetings. *Paediatr Respir Rev*. 2011;12(3):208-13.
7. Hiemstra R, Sisco B. *Individualising instruction. Moving from Pedagogy to Androgogy*. San Francisco: Jossey-Bass; 1990. Available from: <http://www.distance.syr.edu/androgogy.html>. [Last accessed on 2014 Mar 20].
8. Graham R, Crawley E. Making Projects Work: a review of transferable best practice approaches to engineering. *Project based learning in UK. Engineering Education. The Higher Education Academy Journal*, 5(2):41-9. Available from: <http://www.journals.head.ac.uk/doi/full/10.11120/ened.2010>.
9. Blumenfeld PC, Soloway E, Ronald W, Krajcik JS, Guzdial M, Palincsar A. Motivating project based learning: sustaining, supporting the learning. *Educ Psychol*. 1991;26(3-4):369-98.

10. Bradford M. Motivating students through project based service learning. *THE J* 2005;32(6):29. ERIC 6.
11. Crooks DL, Kilpatrick M. In the eye of the beholder: Making the most of poster presentations – Part 2. *Can Oncol Nurs J* 1998;8:154-9.
12. Bhuiyan PS, Rege NN, Supe ON. Learning and motivation. In: Parkar SR, Shah F, editor. *The Art of Teaching Medical Students*. Chapter 6. Maharashtra: Medical Education Technology Cell, Seth G.S. Medical College and KEM Hospital.
13. Moore LW, Augspurger P, King MO, Proffitt C. Insights on the poster preparation and presentation process. *Appl Nurs Res.* 2001;14(2):100-4.
14. Hardie J, Coad J, Devitt P. Ten steps to successful conference presentations. *Br J Nurs.* 2007;16(7):402-4.
15. Accessed from: [www.bie.org/PBL strategies](http://www.bie.org/PBL_strategies). Accessed on Nov 28, 2013.
16. Pelletier D. The focused use of posters for graduate education in the complex technological nursing environment. *Nurse Educ Today.* 1993;13(5):382-8.
17. Boullata JI, Mancuso CE. A “how-to” guide in preparing abstracts and poster presentations. *Nutr Clin Pract.* 2007;22(6):641-6.
18. Taggart HM, Arslanian C. Creating an effective poster presentation. *Orthop Nurs.* 2000;19(3):47-9, 52.
19. Brodsky L. In: Whaler PG, editor. *Why model? Professional model making, history, practice, tips, tricks and thinking loud*. Saturday Aug 21, 2010. Available from: <http://www.promodelmaking.wordpress.com>. [Last accessed on 2013 Nov 11].
20. Chaffee H. Ten talents of a model maker. Available from: <http://www.Modelmaker.org>, <http://www.serc.carleton.edu/introgeo/models/>. [Last accessed on 2013 Apr 22].
21. Thomas M. *Effective Teaching*. Chapter 2. Motivation an energizer. Ramnagar, Delhi: S. Chand and Co.; 2008: 20-3.
22. Hardie M. An inquiry based learning approach to teaching about planning regulations. *Transactions.* 2009;6(2):5-18. [Last accessed on 2014 Feb 05].

doi: 10.5455/2319-2003.ijbcp20140816

Cite this article as: Samuel LJ, Bhandodkar LV, Rataboli PV. Poster and model competition: a novel interest-generating teaching tool in the subject of pharmacology. *Int J Basic Clin Pharmacol* 2014;3:649-55.