

# Evaluation of anatomy comic strips for further production and applications

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**Abstract:** The corresponding author of the study has been sketching comic strips to explain anatomy in a humorous manner. All the anatomy comic strips, including those in Korean (650 episodes) and English (451 episodes), can be viewed on the homepage (<http://anatomy.co.kr>). Such comic strips were created with the aim of assisting medical students. However, their impact was unknown, and therefore, we surveyed the students' responses. We noted that anatomy grades were better in the students who read the comic strips. The comics helped the trainees chat with individuals with and without a medical background. The authors also considered comments on the problems with the comic strips and attempted to find solutions. The episodes are being currently used and further produced for educational purposes. To support this effort, the readers' valuable opinions will be continuously collected and assessed.

**Key words:** Artistic anatomy, Cartoons, Humor, Medical education, Questionnaires

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## Introduction

During a period of 13 years, the corresponding author of this article (M.S.C.) has drawn 4-frame comic strips, entitled Dr. Anatophil. At the time of the previous report in 2011, only 13 episodes had been translated into English [1]. At present, 451 episodes in English and 650 episodes in Korean are available.

All the comic strips are freely accessible on the homepage (<http://anatomy.co.kr>). These have also been uploaded on Facebook (page: anatomy comic strips). An individual may download the comic strips from this site and can use these for commercial or non-commercial purposes. Examples are her/his own homepage, smart phone application, PowerPoint

presentation, exhibition on anatomy, and even printed material such as textbook of anatomy and article in journal.

The comic strips illustrate not only tips for remembering anatomy, but also the medical students' experiences with studying anatomy and an anatomist's ridiculous lifestyle. The purpose of these comics was to assist the students in many ways. We had observed the effect of these comic strips [1], but had not quantified its impact. Therefore, the authors decided to assess responses of the main readership, medical students with a questionnaire-based survey. In the present study, we intended to facilitate further development and better application of the anatomy comic strips after evaluating the outcomes.

## Materials and Methods

The authors belonged to 2 Korean medical schools, where 93 students (60 males, 33 females) learned human anatomy in 2012. Before beginning the series of lectures on anatomy, printouts of 650 Korean comic strips were distributed among

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the students, who were recommended to read them.

After the anatomy class, scores of the students were collected. As the main theme of the comics was gross anatomy, the students' grades in histology and neuroanatomy were not collected. The association between the anatomy scores and the students' exposure to the comic strips was measured. The statistical analysis (unpaired *t*-test) was performed using SPSS software ver. 16.0 (SPSS Inc., an IBM Co., Chicago, IL, USA).

Medical students who had read the comic strips and had volunteered to participate in the survey were asked to select the manners in which the comic strips were beneficial. They

were also asked to comment on the drawbacks of comics and suggest ways to improve the comics.

### Results

Among 93 students, 70 (75.3%) reported that they had read at least 1 episode. Concerning sex difference, 47 out of 60 males (78.3%) and 23 out of 33 females (69.7%) enjoyed the comic strips (Table 1).

The anatomy grades were higher in students who read the comic strips than those who did not; this difference in grades was significant in females ( $P=0.0096$ ) (Table 1).

The primary purpose of the comic strips was to aid medical students in memorizing the complexities of anatomy (Fig. 1). The number of females who agreed that the comic strips served this purpose was greater than the number of males (Table 2).

The second and third beneficial features of the comic strips, as determined by the students surveyed, were to encourage readers to enjoy chatting. Female students reported

**Table 1.** Anatomy grades of medical students with and without exposure to the comic strips

	Male	Female	Total
With exposure	67.9±10.6 (47)	67.6±8.9 (23)*	67.8±10.1 (70)*
Without exposure	64.0±6.3 (13)	56.9±9.4 (10)*	60.9±8.6 (23)*

Values are presented as mean±standard deviation (number).

Full score, 100.

\* $P<0.05$ .

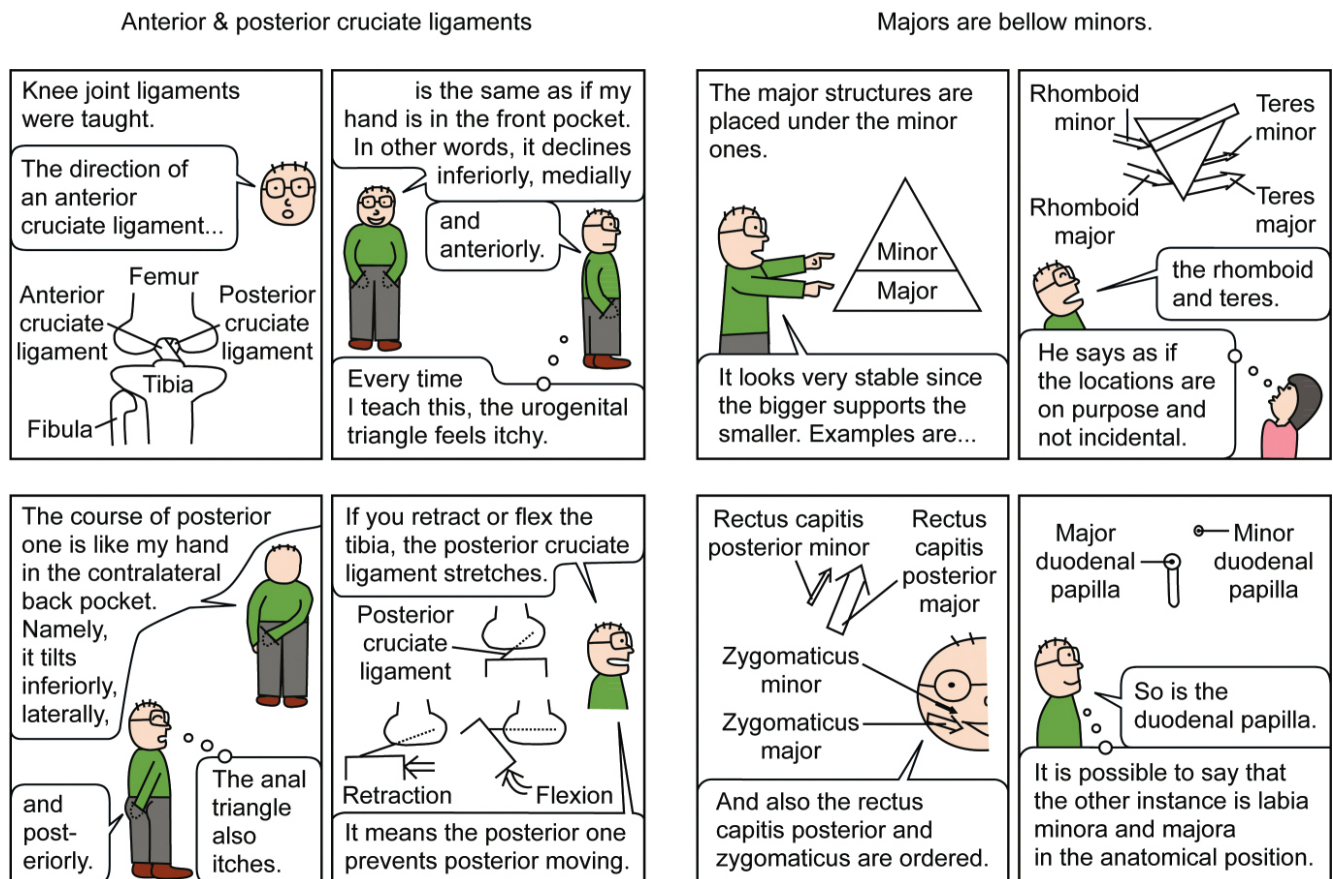


Fig. 1. Two representative comic strips to assist medical trainees' learning of anatomy.

that they shared these comic strips mainly with individuals lacking a medical background such as family and friends, whereas male students shared them more frequently with individuals having a medical background such as other classmates and clinicians (Table 2).

Male students also believed that the comic strips helped them to change their attitude towards anatomy and medical studies, in general (Table 2).

**Table 2.** Responses of medical students about how the comic strips help them

	Male (n=47)	Female (n=23)	Total (n=70)
Memorize anatomy contents	47.9	70.8	55.6
Enjoy chatting with non-medical persons	27.1	83.3	45.8
Enjoy chatting with medical persons	41.7	25.0	36.1
Change attitude toward anatomy	37.5	25.0	33.3
Change attitude as medical student	31.3	12.5	25.0
Decide specialty after graduation	4.2	4.2	4.2
Memorize clinical material	6.3	0.0	4.2

Values are presented as percentage.

Multiple choices are allowed.

Additional narrative comments regarding the problems with the comic strips were collected and have been listed in Table 3.

### Discussion

An interim evaluation of the effect of the comic strips created by the corresponding author was needed in order to make the strips more effective and helpful for the target audience.

The medical students who had read the comic strips achieved better scores in gross anatomy (Table 1). This result indicates the relevance and value of the comics. Comics provide short stories that make learning details more enjoy-

**Table 3.** Disadvantages or critical comments on the comic strips

I don't like two-dimensional caricatures.
I feel an aversion to the adult jokes.
Order of episodes is not systematic.
It would be better to lengthen each episode beyond 4 frames.

#### Bodybuilder's sorrow



#### Hystachian tube

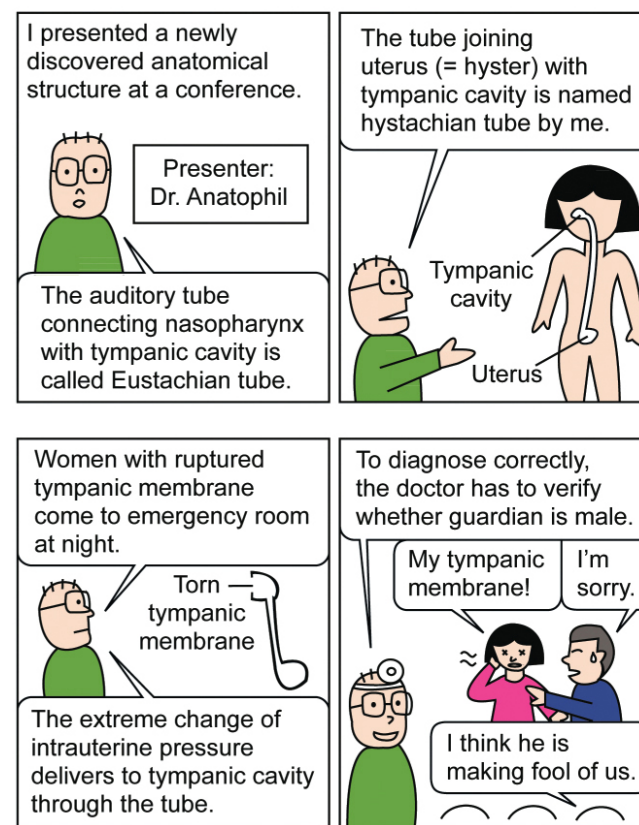


Fig. 2. Comic strips containing adult jests.



able (Fig. 1) [2-5]. However, this observation does not prove that the comic strips contribute greatly to the learning of anatomy.

Female students recognized the value of the comic strips in the memorization of anatomic details to a greater extent as compared to the male students (Table 2). This probably indicates that female students are able to more effectively utilize a variety of learning resources than male students.

The medical students acknowledged the role of comic strips in stimulating friendly talks (Table 2). This was an expected result because the comic strips that depict their behaviors build a potential bridge between medical students and their acquaintances. This outcome is valuable, because students may gain empathic, observational, and communication skills from the comics. In the future, the students would be able to use appropriate and uncomplicated terms learned from the comics to teach their patients about disease processes. Thus, comics will be increasingly used in the medical humanities [6].

Further, each student could be nourished by the nature of the comics. The reader's imagination transforms the physical space among frames into a coherent story. The reader thus becomes active participant in the narrative and often identifies oneself with the drawn characters [7, 8].

There was gender difference in the perception of social usefulness of the comic strips. Male students preferred informal discussion and association in medical school, whereas female students shared these comics more with family and private friends (Table 2). Particularly in Korea, male students tend to value their collaboration with colleagues in the same school that results in many sociable words with them.

The authors carefully considered the students' comments regarding flaws in the comic strips, because this would help in compensating them. The first indicated drawback was the awkward illustrations (Table 3). This is similar to other report that science comics, with their striking artwork that is designed to be enjoyable, might misrepresent actual science [9].

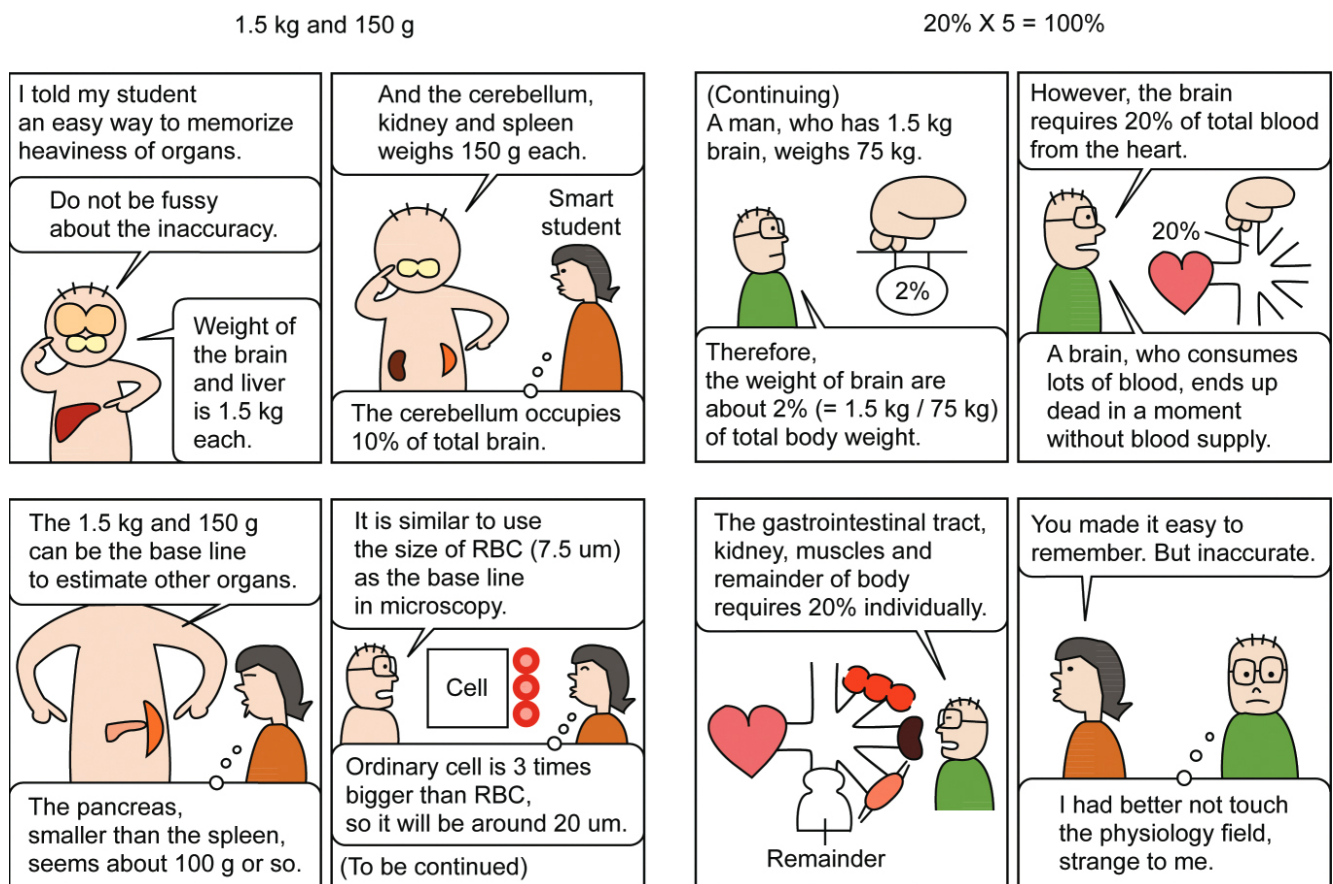


Fig. 3. Two relevant serial episodes of comic strips comprising multiple systems.

This could be because the author of the comic strips focuses on writing and not on drawing. Therefore, less time is spent on the illustrations, including the character of Dr. Anatophil. However, the anatomic structures in the comics are relatively accurate because they are based on over two decades of experience in teaching anatomy on a drawing board (Fig. 1). Comic pictures may be retouched by a publishing company for commercial reason some days. A concern with such commercial exercise is that the author's vision may

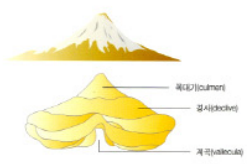
be distorted [9].

The second negative comment was regarding the adult level of the jokes. The author designs the comic strips for adults, including medical students. This is different from the other popular comics that are often targeted at young children [8-10]. The author of the comic strips feels more comfortable using an adult level of humor to help explain anatomy (Fig. 2), excluding humor that may dishonor donated cadavers. To prevent discomfort among students in the classroom, the



재미있는 이야기

- **소비어** *con-* arbor *visus*(나무)는 라틴어 arbor(나무)와 *visus*(목숨, 생명, 활력)에서 유래되었다. 소비의 시상단면은 마치 나뭇가지처럼 보이기 때문에 중세 해부학자들이 생명의 나무라고 이름 붙였다. 이 *visus*에서 영어 *vital*(생명의, 생생한), *vitality*(생명의, 활기), *vitamin*(비타민)이 파생했다. 영어에서 arbor는 나무, 수목을 의미하며, arborvitae는 나무의, 나무에서 사신이라는 뜻이다. 갈프루, 영어로 arborvitae는 측백나무이다.
- **Valley** *coll-* *coll-* arbor *visus*(나무)는 라틴어 arbor(나무)와 *visus*(목숨, 생명, 활력)에서 유래되었다. 소비의 시상단면은 마치 나뭇가지처럼 보이기 때문에 중세 해부학자들이 생명의 나무라고 이름 붙였다. 이 *visus*에서 영어 *vital*(생명의, 생생한), *vitality*(생명의, 활기), *vitamin*(비타민)이 파생했다. 영어에서 arbor는 나무, 수목을 의미하며, arborvitae는 나무의, 나무에서 사신이라는 뜻이다. 갈프루, 영어로 arborvitae는 측백나무이다.
- **Culmen** *cul-* 라틴어 culmen(정수, 산꼭대기)에서 유래되었다. 영어 culmination(최고점, 최고조, 최고성)과도 관련이 있다. 소비를 작은 산에 비유했을 때, culmen은 산꼭대기에 해당하는 부위이다.
- **Decisive** *dec-* 라틴어 decisus(가운데, 절사선)에서 유래. 머리의 뼈의 incisus(비스듬)도 관련어
- **folium** *fol-* *fol-* 라틴어 folium(잎)에서 유래. 영어 folium(잎)도 관련어.
- **Uxialis** *ux-* 라틴어 uxa(작은 포도송이)에서 유래. urula polina는 일한장에 있는 (목통). 이 urula는 urula(포도송이)에 지시사가 붙은 것. 이와 같이 소비는 다양한 자연 품종으로 가득차 있다.



Cartoon



The cartoon is drawn by Min-Suk Chung who is Professor in Department of Anatomy, Hanyang University School of Medicine, Seoul, South Korea. He received his B.S., M.S., and Ph.D. degrees from Seoul National University. For his master's and doctoral theses, he studied clinical anatomy by dissecting cadavers. After Ph.D. acquisition (1996), he has been interested in virtual dissection and performed preliminary experiments for Virtual Korea. By the financial support of KOSIS for launched Virtual Korea (2003) to improve quantity and quality of the virtual dissection Human Project (2003), he wishes, in the near future, to form a virtual image library capable of convenient and fast access for selecting images and downloading, which will include all data sets from the United States, Korea, and China. He also has been outlining the anatomical structures that will further contribute to medical learning and clinical practice. If you want to know more about Dr. Chung, please go to the website www.anatomyart.com.

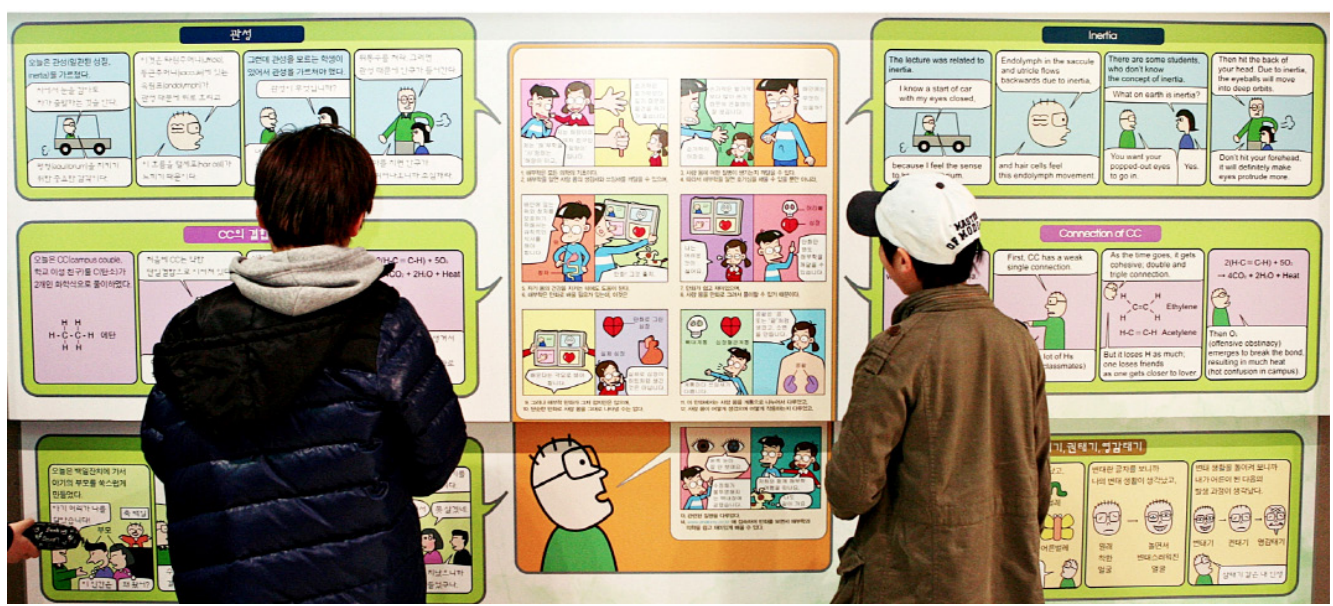


Fig. 4. Various spaces where the comic strips are displayed. Anatomy textbook, neuroanatomy textbook, academic journal (left to right in top), and science museum (bottom).



author does not show the comic strips directly to his students. The episodes could be classified according to the level of the jokes in the new printed materials or websites.

The third issue pointed out by the respondents of the survey was the unorganized order of the episodes (Table 3). Approximately 50 episodes have been simultaneously produced and sorted by the systems. However, the overall serial numbers of the comic strips are chronological. Learning efficacy would be increased if the comic strips were arranged according to systemic or topographic anatomy. However, this classification may be hindered by the fact that certain comic strips deal with 2 or more systems or anatomical regions in a single episode (Fig. 3). A solution could be an index method that would embed anatomical keywords into every episode.

A comic book containing 631 episodes of these strips has recently been published. Among them, 259 episodes are intended to help students learn the anatomy in a straightforward and amusing manner. The episodes are ordered systematically. The wanted episodes can be located by using the index of anatomical terms. The other 372 episodes deal with the humorous life of an anatomist (or a scientist) for education and research to provide readers with a better perspective of anatomy and science [11, 12].

The other problem that was reported was that the episodes were too short (Table 3). The intention of these comic strips is to allow readers to immediately peruse each episode, which is a sequence of 4 frames. Occasionally, 2 or 3 serial episodes are related, which are indicated by 'To be continued' and 'Continuing'. In such cases as well, each episode narrates an independent story (Fig. 3). An alternative method would be to rewrite continuous anatomy stories on the basis of the grouped episodes and compose chapters that handle body regions or systems [13]. The author aims to take up this challenge concurrently with preparing a greater number of comic strips.

Another aim of the comic strips is to inform the general public regarding anatomy. These comic strips may answer or stimulate their curiosity about the human body and medical school to some extent [1]. This is especially suited for children and adolescents who consider attending medical school.

Other audiences of comic strips include users of different media. Due to the author's policy of distributing the comic strips without any fee, some of these comic strips have already been included in Korean textbooks on anatomy and neuroanatomy [14, 15]. In addition, the comics are serially published in an international academic journal (Journal

of Acupuncture and Meridian Studies), since they provide sympathetic and amusing tales to the subscribing scientists. The comic strips in both Korean and English are exhibited in Korea's biggest science museum to motivate children to become acquainted with anatomy (Fig. 4) [5].

New episodes of comic strips are to be prepared to explain anatomy through a humorous approach, and their applications are becoming broader. For future episodes and practical advantages of the comic strips, the readers' comments from inside and outside the medical school will be collected and assessed.

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