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Part B of Anatomy Tour at the Mall: A Multimodal Activity to Enhance Anatomical Education and Health Awareness in the General Public

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Abstract

Research objectives: The overall health state of people in the United States is deteriorating. One component related to this decline was the lack of information. One approach to resolve this issue is with educational outreach activities located in one of the places most visited by the people: Malls. Here, we report the various benefits of educational anatomy outreach among the people who participated.

Purpose: This study aimed to promote essential health awareness by educating the general public about anatomy.

Methods: 72 subjects were randomly selected from malls within Dallas/Ft.Worth area to participate in the "Anatomy Tour at the Mall" (A@M). The participants were given a pre-test with 10 questions and release forms. They were then given information about the human systems by passing through six different data stations: the nervous system, special senses, musculoskeletal system, human organ station, cardiovascular system, and respiratory system tables. Each table contained anatomical models, an educational brochure, non-invasive vital sign tests (except for the human organ station), and the physical therapy and nursing students who explained the essential anatomical information and performed the tests (Figure 1). When the participants finished the "tour" through the stations, they were given a post-test with the same 10 questions for comparison. The subjects were also given a short survey to rate the stations and their activities.

Results: A t-test statistical analysis showed that the participants improved their knowledge of anatomy when comparing the pre-test and post-test. The pre-test average was 5.9 ± 1.8, and the post-test average was 7.5 +/± 1.9. The difference between the pre-test and post-test was 1.6, with a p-value of 0.001. In addition, the majority of the participants' survey responses regarding this activity were positive, indicating that they gained significant knowledge about anatomy and overall health after completing this activity.

Conclusion: A@M significantly increased knowledge about the basic anatomy of the participating adults. Future outreach events should expand to other areas and be incorporated daily in public places, such as shopping malls, to reach out to the population lacking educational information.

Introduction

Health in the United States has declined, and many components, such as diabetes, obesity, deficient diet, and physical inactivity, reinforce the probability of premature death [1]. Moreover, the prevalence of cardiovascular disease is high in the USA [1], while in Texas, diverse health-related factors influence the population's quality of life. What is disquieting is that a substantial portion of the public (83%) are not getting adequate physical activity, a simple solution to avoid health issues such as type 2 diabetes and cardiovascular disease [1]. Therefore, what can researchers do to promote the general public to understand health risks, gain anatomy knowledge, and enhance their health?

One feasible alternative to target this health deterioration is educating the community and encouraging healthy lifestyle modifications through educational activities [1-4]. According to various studies, educational outreach activities are more valuable when associated with real-world settings while employing a community-based participatory approach [5-7]. In addition, these activities based on anatomy enhance knowledge and awareness in the community, thus accentuating the importance of health literacy and lessening the risk factors related to health conditions [8].

In 2018, a faculty spearheaded an initiative to promote health awareness and early signs of health-related issues at the School of Physical Therapy, Texas Woman's University in Dallas Campus, and another participant school, targeted malls around Dallas/Fort Worth in Texas. The 'Anatomy Tour at the Mall' outreach activity (A@M) had two main parts; part A promoted health awareness and identified the health-related factors through various non-invasive tests and measurements. Part A found that the community lacked basic knowledge of anatomy and physiology. The study also showed that community participants displayed lower limb weakness, decreased balance, and reduced gait time, increasing the risk of acquiring comorbidities and health problems [9].

Based on the above information, the ongoing study proposed that employing simple tools based on basic anatomy knowledge could educate the general public on health-related risks that might be unknown to them. Furthermore, early identification of health-related issues can promote lifestyle adjustments to avert disability and mortality in long-term care facilities. Therefore, the specific intent of the present inquiry, part B A@M, is to employ anatomy as a teaching device and provide health information to participants. Thus, the objectives of this current report were two fold: (1) to educate the public about the human body and their health through anatomy, and (2) to promote healthy lifestyles in general public.

Methods

Participants

For this outreach activity, coordinators sent out emails to three different malls in Dallas, Denton, and surrounding areas in North Texas with information about the activity and to ask for permission to use their facilities, to which three malls responded positively. A total of 72 participants were randomly selected when they entered the Mall or walked by the stations. The study was approved by the Institutional Review Board of the West Coast University Center for Graduate Studies in Dallas, Texas (the other participating school). After explaining the purpose of the activity, all participants signed an informed consent form before their involvement in the A@M activity.

Outreach Activity Overview

Stations: At each station (see Figure 1), nursing students and physical therapy students provided anatomical information related to each system using anatomical models and an anatomy educational brochure. Please refer to '*Part A of the Anatomy at the Mall*'s publication to learn about the methods on the different vital signs and other non-invasive physical tests that were also performed at each station [9].

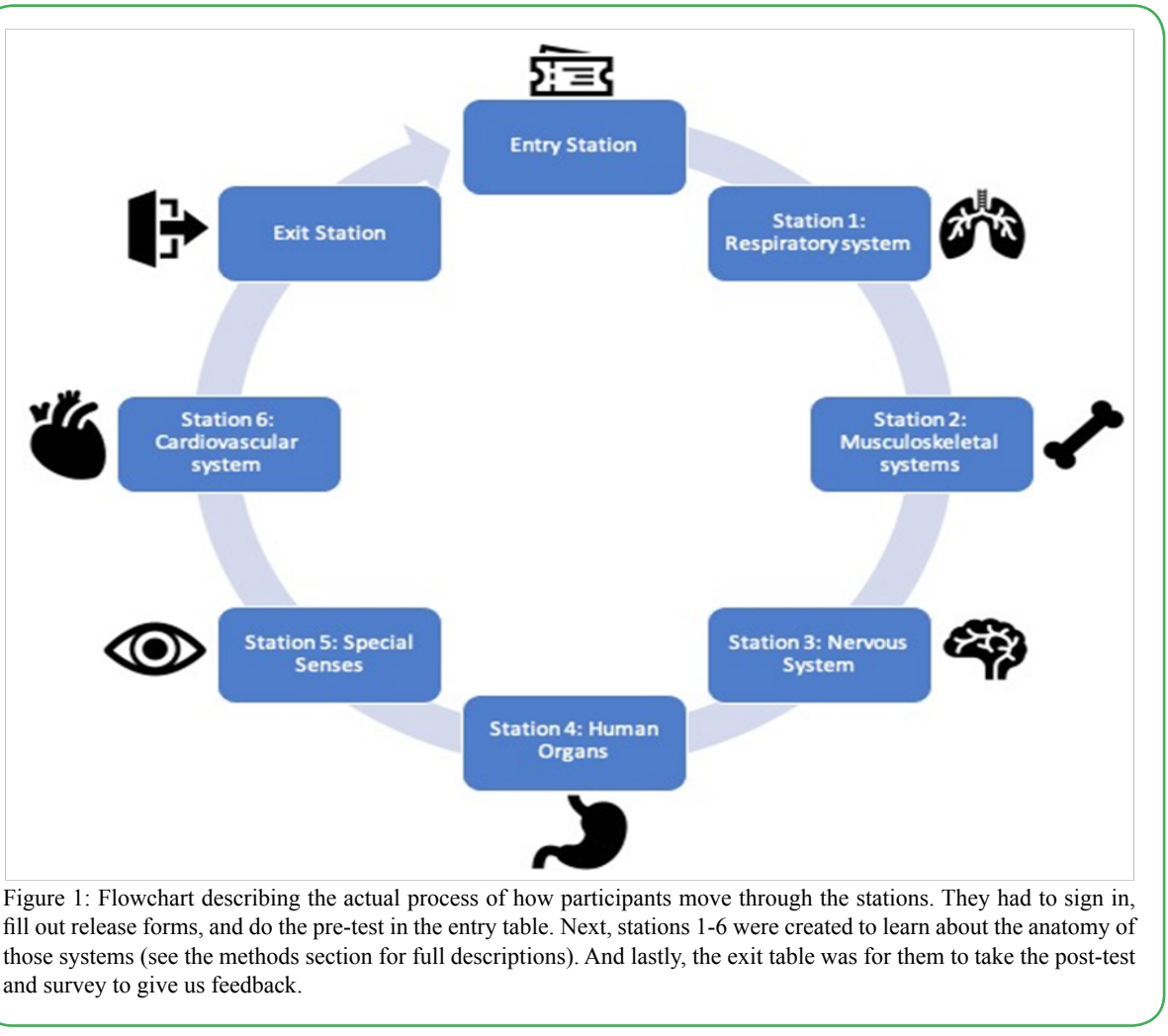

Figure 1: Flowchart describing the actual process of how participants move through the stations. They had to sign in, fill out release forms, and do the pre-test in the entry table. Next, stations 1-6 were created to learn about the anatomy of those systems (see the methods section for full descriptions). And lastly, the exit table was for them to take the post-test and survey to give us feedback.

Entry Table: Each subject was instructed about the activity and their role in participating. Subjects who provided informed consent were given a 10-question pre-test to assess their basic anatomy knowledge before participating in the study (Appendix A). Participants then went to each of the six main stations: the nervous system, special senses, musculoskeletal system, human organ table, cardiovascular system, and respiratory system. At the **Special Senses Station**, we educated participants on each special sense: vision, hearing, smell, taste, and touch. The **Nervous System Station** explained the anatomy and function of the different parts of the nervous system (CNS, PNS, and autonomic) and the three major systems used for balance (vestibular, proprioception, and vision). The **Musculoskeletal Station** provided participants with information on the muscles, bones, and basic exercise recommendations. The **Cardiovascular Station** showed the basic anatomy of the human heart and an explanation of the blood flow through the heart. At the **Respiratory Station**, we taught the participants about the anatomy of the lungs, the bronchial tree, and the upper respiratory system. **Finally, the Human Organ Station (optional)**, we provided the opportunity to observe human organs from cadavers. Participants were able to learn about the anatomy of the lungs, heart, liver, gallbladder, kidney, and spleen. If participants decided to participate in the organ station, they were taught about the functions and disorders of the organs concerning health and wellness. The participants did not handle any of the organs; however, if requested, they were allowed to touch the organs after wearing gloves. All handling, teaching, and demonstrations were performed by students. (Figure 1)

Exit Table: A 10-question post-test, composed of the same questions as the pre-test, was given to participants after they completed all stations to measure learning in human anatomy. Participants were also given a survey to gain insight into their perception of the activities by rating each table and determining whether they found this outreach activity beneficial **(Appendix B)**. (Figure 1-2)

Appendix A

Pre-test and Post-test questionnaire given both before and after the activity.

Date: _____ Age: _____ Gender: ___

Instructions: Multiple choice. Make a circle in the correct answer.

1. The brain and spinal cord make up this division of the nervous system.
   a. central nervous system (CNS)
   b. peripheral nervous system (PNS)
   c. somatic division of the peripheral nervous system
   d. autonomic nervous system (ANS)
2. The special senses include all of the following EXCEPT:
   a. Vision
   b. Audition
   c. Gustation
   d. Muscle contraction
   e. Olfaction
3. In addition to supporting and protecting the body, the skeleton provides this function as well.
   a. Its muscles provide movement.
   b. The bones store fat, red marrow, and calcium.
   c. Its cartilages produce blood.
   d. None of the above
4. The pumping chambers of the heart that bring blood to the lungs and body are _____.
   a. both atria
   b. both ventricles
   c. the right atrium and ventricle
   d. the left atrium and ventricle
5. The function of the respiratory system is to _____.
   a. supply the body with oxygen and eliminate carbon dioxide
   b. supply the body with oxygen and carbon dioxide
   c. create oxygen and break down carbon dioxide
   d. convert carbon dioxide to oxygen and carbon
6. According to the American Heart Association, what is a normal blood pressure measurement?
   a. Less than 120/80 mmHg
   b. Higher than 120/80 mmHg
   c. Less than 140/90 mmHg
   d. Higher than 140/90 mmHg
7. The American College of Sports Medicine guidelines suggests that a healthy adult gets at least ___ minutes of moderate to vigorous exercise per ___.
   a. 30; week
   b. 1000; year
   c. 150; week
   d. 30; year
8. Our muscles are made of the following proteins EXCEPT:
   a. Acetylcholine
   b. Actin
   c. Myosin
   d. Troponin
   e. Tropomyosin
9. T/F: Our lungs can collect air to exchange gases such as carbon dioxide and oxygen.
   a. True
   b. False
10. T/F: The liver can filter blood plasma to get rid of excess waste.
    a. True
    b. False

Appendix B

Survey given to participants to evaluate the activity.

Survey | Anatomy Tour at the Mall

Instructions: Please read the following questions and answer honestly. We appreciate your feedback.

1. On a scale of A, B, C, D or F (where **A means 'excellent'** and **F means 'failed'**), how would you rate the *Anatomy Tour at the Mall* outreach activity?
   a. A
   b. B
   c. C
   d. D
   e. F
2. Which station was your favorite station?
   a. Entry station
   b. Nervous system station
   c. Special Senses station
   d. Musculoskeletal system station
   e. Organs tent station
   f. Cardiovascular system station
   g. Respiratory system station
   h. Exit station
   i. None of the above
3. Which station was your least favorite station?
   a. Entry station
   b. Nervous system station
   c. Special senses station
   d. Musculoskeletal system station
   e. Organs tent station
   f. Cardiovascular system station
   g. Respiratory system station
   h. Exit station
   i. None of the above
4. On a scale of 1-5 (where 1 means '**not at all**' and 5 means '**absolutely/worth it**'), was this activity worthy of your time?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5
5. In a scale of 1-5 (where 1 means '**not beneficial at all**' and 5 means '**completely beneficial**') was this activity beneficial for you?
   a. 1
   b. 2
   c. 3
   d. 4
   e. 5
6. Do you believe you have gained significant/important/vital anatomical and health knowledge by participating in this outreach?
   a. Absolutely b. Yes c. Somewhat d. Not Really
7. Do you have any additional comments or changes to this activity?

   _____

   _____

THANK YOU FOR YOUR TIME!

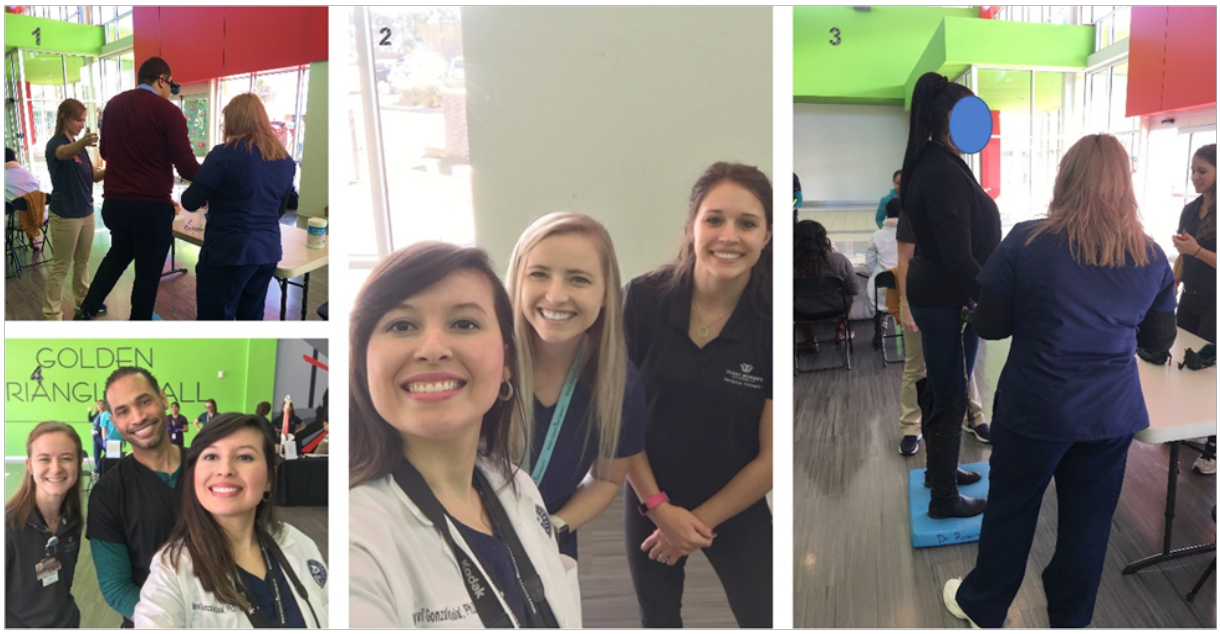

Figure 2: The figure illustrates participants engaging in various stations' activities (1, 3), additionally, faculty and students during the event mentioned above (2, 4) during the event.Participant's faces are covered to protect identity.

Data Analysis

The pre-and post-test data were analyzed using the SPSS Data Analysis 25 system for a t-test analysis. A p-value of <0.05 was used to determine significance.

Results

Participants: 72 subjects from three 3 different mall activities participated in this study. The average participant age was 32.6 years, weight was 174.3 lbs, and height was 5'5, respectively (Table 1).

Anatomy component: The average of the pre-test and post-test scores were calculated. The 10-question pre-test average was 5.9 ± 1.8. The 10-question post-test average was 7.5 +/± 1.9. The difference between pre-test and post-test scores was 1.6, with a p-value of 0.001. The results are presented in Table 2.

Activity Survey: On a scale of 0-5, with 5 being "absolutely worth it," the average score was around 4.7 for questions regarding if they found this activity worth it, beneficial, and whether they gained any health knowledge. The overall grade was A for this activity, with 64 out of 72 participants who graded the activity. Additional information on the survey questions and results can be found in Tables 3-6.

Characteristics	Mall Sample Size	Mall Participants
Age	72	m= 32.6± 16.4
Weight (pounds)	70	m= 174.3±46.9
Height (feet. inches)	37	m= 5.5±0.3

Table 1: Characteristics of the study participants.

	Pre Test Score	Post Test Score	P-Value
Anatomy Test	5.9+/-1.8	7.5+/-1.9	0.001

Table 2: Anatomy Test Score.Results of t-test performed between pre-test and post-test. Significance level set at p≤0.05.

How would you rate the Anatomy Tour at the Mall outreach activity on a scale of A, B, C, D, or F (where A means 'excellent' and F means 'failed')?		Points
Mean of Rating	3.89+/-0.4	A 4 B 3 C 2 D 1 F 0
Grade	Responses	
A	64	
B	6	
C	1	
D	0	
F	0	

Table 3: Survey Score for Question 1

Responses	Tally
A. Entry Station	2
B.Nervous System	13
C.Special Senses	17
D. Musculoskeletal system	3
E.Organ	20
F. Cardiovascular System	11
G. Respiratory system	3
H. Exit station	0
None	10

Table 4: Survey Which Station is your Favorite Q 2

Responses	Tally
A. Entry Station	4
B.Nervous System	6
C.Special Senses	4
D. Musculoskeletal system	11
E.Organ	7
F. Cardiovascular System	1
G. Respiratory system	0
H. Exit station	2
None	42

Table 5: Which Station was your least favorite Q 3

	Score	
Q 4) Was the activity worthy of your time?	4.6+/-0.9	1= not at all 5= absolutely worth it
Q 5) Was the activity beneficial for you?	4.7+/-0.9	1= not beneficial 5= completely beneficial
Q 6) Do you believe you gained important anatomical health knowledge participating in this outreach?	4.7+/-0.9	5 = Absolutely 4 = Yes 3 = Somewhat 0 = Not Really

Table 6: Survey Score for Questions 4-6.

Discussion

The focus of A@M part B was using anatomy as a teaching tool that provided health awareness to the general Public. Therefore, the goals of this current report were twofold: (1) to educate the general public about the human body and their health through anatomy, and (2) to improve well-being and encourage healthy lifestyles among general public.

The current study established the A@M to educate the general public on health issues using anatomy and anatomy structures as tools. Therefore, we collected quantitative data (pre-and post-test scores) and qualitative data (survey) to better understand the acquired knowledge of the participants and their perception of the activity. Based on the outcomes gathered in the current report, the A@M activity prompted anatomy education in addition to success.

First, the main findings of the current report were the acquired health-related anatomy knowledge of the participants, proven by the higher score in the post-test. This previous remark indicates that the activity successfully educated the participants about anatomy and its relation to health, which directly benefits partaking in the A@M activity. The benefits of outreach and service activities have been established in various studies. For instance, activities that focused on community participants were reported to be beneficial in promoting awareness of ethical and societal issues [10], professional development [11], clinical skills, and cultural awareness [12,13]. The main difference between A@M and the previously cited studies is that A@M focused on educating community members on health-related issues. This is the first study to combine awareness with anatomy in community locations, such as a mall, to the best of our knowledge. Part A of this initiative was published [9], and health-related issues were reported in those who participated. Furthermore, investigators have suggested that activities such as A@M are necessary to promote health awareness and education in community-dwelling adults [9].

The second discovery of A@M was related to activity success. The average score of 4.7/5 indicates that participants found the activities worth their time and enjoyed participating in the stations above. The favorite station was the human organ station, and the most common response to the least favorite station was "none of the stations." The majority of the mall participants rated this outreach activity as excellent, had primarily positive comments, and wanted more of these activities in the future. These findings concur with previous studies on health literacy interventions, yielding positive outcomes and improvements in knowledge [14]. An evident excitement received A@M activity from the participants. This enthusiasm can be attributed to the diverse anatomical components and information shared by the activity. Some of the examples of participants' feedback were “great for the community to be given important info,” ”Awesome, do it again,” ``I learned a lot and had a great time!”, “Great job, I loved it,” "Let me know when you have another one, so I can tell my friends," and finally, " This was so fun! Thank you!”. These comments, paired with the results of the examination, suggest the A@M activity was a success and advantageous for those who participated.

The main impediment of the current study is the limited collaboration with different malls, which prevented us from holding these events on their property. Even though the coordinators reached more than three malls, several locations denied access and refused collaborations with this initiative, making it difficult to expand and reach more people. We expect this activity's positive findings and benefits will encourage malls and other facilities to be more susceptible to holding these events in the future. Regardless, deliberations were initiated to promote the A@M initiative in other areas of Texas.

Conclusion

Due to the sample size of the current study being small compared to the Texas population, our findings and data cannot be generalized. Nevertheless, as per the results of this study, along with the reports from the participants, it can be concluded that A@M or similar activities should be added in more locations in the United States to continue to promote health awareness and education. As demonstrated above, participants found this activity of importance, indicating that similar events can be used to foster growth in community residences. Future directions will also include an online component to reach more people in diverse areas or states, not just Texas. Further, the A@M was composed of physical therapy and nursing students and faculty, and considerations will be made to expand the interdisciplinary collaborations among the activities. Finally, when the pandemic is finalized, we plan to continue promoting this activity in other malls while making some safe adjustments (such as the use of masks) to continue to benefit the community. Further research should be conducted to assess the value of similar activities in different states and explore the benefits of A@M in diverse populations.

Declaration

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Conflicts of interest/Competing interests: Authors report no conflict or competing interest.

Ethics and Consent: The author utilized the ARECCI tool to stipulate and justify that this examination is classified under the Program Quality Improvement. The ARECCI tool is advised instead of an institutional review board. This report can be accessed at this URL. albertainnovates.ca/programs/arecci/

Availability of data and material (data transparency)

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