Abstract: With Hawaii being home to thousands of athletes and cardiovascular exercise enthusiasts, it is beneficial and important for those who engage in cardiovascular exercise and activities to know how to warm up properly. Understanding the benefits and importance of a proper warm up routine prior to performing cardiovascular exercise may decrease the risk of injury and improve overall performance. This paper describes the development and evaluation of a web-based instructional module on proper warm-up techniques for cardiovascular exercise for adult learners. A total of 17 research participants took part in the study, most of who exercise on a regular basis. The results of the study showed a 17 percent increase from pre- to post-test scores. Due to the small sample size of this research study, additional research should be conducted to inform the public about warming up before performing cardiovascular exercise, with hopes that fewer injuries will occur and people will be able to push themselves to their full potential.

Introduction

Hawaii is home to a large number of athletes, and many of them happen to be endurance athletes or cardiovascular exercise enthusiasts. With an average temperature of 75 degrees Fahrenheit in the Hawaiian Islands, many residents take advantage of the nearly perfect weather by engaging in a wide range of outdoor cardiovascular activities (e.g., running, swimming, cycling, hiking, surfing, etc.). The Ford Ironman World Championship triathlon and the Honolulu Marathon are two examples of how prevalent these massive endurance events are in Hawaii. In the 27th Annual 2011 Great Aloha Run, over 19,000 participants made their way from the Aloha Tower Marketplace in Downtown Honolulu to Aloha Stadium. The large number of endurance cardiovascular event participants signifies a need for proper warm-up education to take place to ensure the safety and well being of Hawaii’s people. The purpose of this instructional design project is to develop and evaluate a web-based instructional module on proper warm up techniques for cardiovascular exercise for adult learners.
Background

The use of warm-ups in cardiovascular exercise has been overlooked in today’s society. Many people perform one or two static stretches before jogging or running and little is known about the importance of proper warm-ups. Woods, Bishop, and Jones (2007) suggest that warming-up is intended to improve a muscle’s dynamics so that it is less inclined to injury and also to prepare the participant for the demands of exercise. Keep in mind that this statement claims “warming-up is intended to improve,” meaning that the warm-up itself has not been scientifically proven to work on every occasion. Given the circumstances of various sports injury situations, the athlete may have other undetected health issues, which may cause the injury instead (e.g., dehydration, fatigue, etc.).

In a 2004 study looking at stretching and its relationship to injury prevention, the researchers found that stretching before low-intensity activities is unnecessary due to the fact that the activity does not demand for a very compliant muscle-tendon unit (Witvrouw, Mahieu, Danneels, & McNair, 2004). Activities like jogging and cycling are considered low-intensity activities, but this does not mean one should omit warming up, especially if the activity is some kind of competitive race. Keep in mind that there are other researchers who claim that stretching or warming up has a beneficial effect on injury prevention (Witvrouw et al., 2004); this is just one opinion.

To expand on the support of this learning module, Families Online Magazine (2010) suggests that when the participant warms-up properly, blood flow, oxygen, and nutrient levels distributed to the cells increase and if the participant foregoes a proper warm-up, their body will function less efficiently and the workout will produce less quality results. Research by Vetter (2007) suggests that in theory, the purpose of warming up is to loosen up joints and muscles to reduce the potential risk of injury, to heighten mental awareness and alertness, and to enhance performance by increasing both the body’s core temperature and the speed of neuromuscular responses.

Warming-up and stretching before physical activity is recommended by most sport scientists, however, incorporating a static stretching phase in the pre-activity warm up can be detrimental to muscular power activities (Pearce, Kidgell, Zois, & Carlson, 2009). Additional research studies have concluded that performing a static stretching phase prior to the intended activity may be detrimental to the performance as well. Despite this fact, a static stretching phase has been included in the learning module for a specific reason, which is to prepare the individual for sport-specific dynamic stretching. Sport-specific dynamic stretching implies that specific warm-ups are meant for specific activities (e.g., runners will engage in dynamic stretches focusing on the hamstrings, quads, and hips).

The large number of cardiovascular exercise enthusiasts suggests the need for an instructional module on proper warm-ups. Recognizing the need for the instructional module, the researcher addressed the issue by using the Internet and web-design as the learning medium. The structure of the module included four parts; (1) What is a warm-up?, (2) Why warm-up?, (3) Developing a positive warm-up attitude, and (4) Developing
a warm-up routine. The proposed warm up routine of the learning module is as follows:
(1) The general warm-up, (2) Static stretching, and (3) Sport-specific dynamic stretching.

Methodology

The intended audience for this instructional design project is adult learners at the University of Hawaii at Manoa (UHM). These audience members were chosen because according to Racette, Deusinger, Strube, Highstein, and Deusinger (2010), the period between adolescence and early adulthood is accompanied by lifestyle changes that predispose young adults to become less physically active. As we begin senescence, our bodies start to break down slowly. This means that we, as adults, need to pay closer attention to our bodies and prepare them appropriately for any physical activity.

The module is web-based and was developed using Weebly, a free widget-based web site creator. The module includes illustrational videos to supplement the text, which will focus on the importance and benefits of warm-ups. The videos are embedded throughout the module via YouTube, a video-sharing website, and were not to be considered follow-along instruction. The pre-, embedded, and post-tests are embedded within the module and were created using Google Docs, a free web-based word processor, spreadsheet, presentation, form, and data storage software offered by Google. The one-on-one formative evaluation sessions were conducted and were evaluated by a questionnaire and face-to-face interview.

The small group testing was conducted electronically via the Internet at the convenience of the participant. This allowed the participants to choose when and where they wanted to participate. The main sources of participants were from the UHM Educational Technology department’s e-mail server list. The secondary sources of participants were through friends and family who were interested and willing to participate.

To maintain anonymity, a random number generator was embedded at the beginning of module to allow each participant to create his or her own four-digit number to track each assessment. There was a space to input the four-digit number at the beginning of each assessment.

Results

A total of 17 research participants, eleven females and six males, participated in the study and successfully completed the learning module. The demographics of the study sample consisted of a broad range of six different ethnic backgrounds, eight of the participants being full or part Asian. All the participants were over the age of 22 and were college-educated, six having baccalaureate degrees and eleven having graduate degrees. Seven participants reported they perform cardiovascular exercise at least five-times per week, while only one participant reported they never exercise. 10 of the 17 participants said they believe that performing a warm up prior to performing cardiovascular exercise is very important.
Considering the large number of participants who reported they workout at least *five times per week* and consider warm-ups to be *very important*, the results of the testing may have been slightly skewed due to a very knowledgeable study sample. During the module, the participants were asked to complete four embedded pop-quizzes to promote memory retention. The results of the four embedded pop-quizzes are shown in Figure 1. The results of the pre- and post-tests show a 17 percent difference between the two, with test scores averaging 71 percent for the pre-test and 88 percent for the post-test (Figure 2).

![Figure 1. Pop-quiz results.](image)

![Figure 2. Pre- and post-test results.](image)
Attitudinal survey data suggests that the learning module was quite successful in teaching the participants about the benefits and importance of warm-ups for cardiovascular exercise. 13 participants agreed or strongly agreed that the module successfully taught them about warm-ups (Figure 3). The other four participants scored the question as ‘neutral,’ which can be interpreted as the participants being knowledgeable of the topic prior to the module. Other notable data suggests some navigation issues with the module. While 14 participants agreed or strongly agreed that the module was not difficult to navigate through, the other three participants had issues with navigation, which were explained in the open-ended questions of the survey (Figure 4).

**Figure 3.** Participant scores for effective teaching.

**Figure 4.** Participant scores for module navigation.

**Discussion**

Overall, the results of the study suggest that the participants were very cognizant about the topic because the pre-test scores averaged a fairly high 71 percent. The 17 percent increase from the pre- to post-test scores implies that the post-test questions may have been ambiguous, misleading, or too difficult. A higher post-test score average would
have been ideal to indicate that significant learning had occurred. If research time were not a factor, broadening the scope of the target audience to non-university adult learners would be an ideal way to reach a wider range of the population. Also, refraining from the University’s email server list as a call for participant medium would also help in reaching a wider range of the population.

Some technical issues arose during the testing period, which were addressed accordingly, but may have affected the focus of the participant(s). One participant noted some technical difficulties with using the random number generator, so they created a four-digit number for themselves instead. Fortunately, the other participants did not use the same number. For future purposes, testing out both Windows and Macintosh operating systems and a wide variety of web browsers could resolve the problem.

Another technical issue that emerged during the testing period involved the embedded YouTube videos. A couple of participants reported that they could not watch the videos, but they did not mention the problem until they finished the module. It is unknown why they could not watch the videos, but perhaps it was due to a lack of applicable software (i.e., Adobe Flash Player, which is required to watch YouTube videos). Again, testing out all common operating systems and web browsers would alleviate this problem and also disclaiming an Adobe Flash Player download and installation in the beginning of the module would help as well.

In the call for participants email sent out from the Educational Technology email server list, it was mentioned that the module would take approximately 30 to 45 minutes to complete. However, some participants commented that the module took them longer because there was too much text to read. To rectify the problem, using additional multimedia content could reduce the amount of text content.

**Conclusion**

Acknowledging the benefits and importance of a proper warm up routine was the intent of this web-based learning module. An adequate amount of information was presented throughout the module to teach the participant the most relevant information about warm-ups. The study sample for this learning module was small in size (n=17) and the results may have been compromised due to a very knowledgeable study population. Although assessment results may not have been favorable, majority of the participants agreed that the module was effective in teaching them about the benefits and importance of warm-ups for cardiovascular exercise. The researcher hopes that the information provided through the learning module will positively impact the lives of its participants and other potential future users of the instructional website.
References


