Effectiveness of an Online and Traditional Physical Activity Class on Promoting Physical Activity in College Students

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Abstract

Over the past 10 years there has been an exponential increase in the number of college courses offered in a web-based or online format. Given the increased online learning opportunities and the decreased physical activity (PA) in college students, there may be an opportunity to blend college physical activity courses with online learning to increase physical activity and cardiorespiratory fitness (CRF) in college students. However, an issue of concern in self-paced PA courses is adherence to the activity(s) and maintenance or improvement of fitness and health. The purpose of this study was to determine if an online PA class could be as effective towards promoting PA as a traditional, supervised PA class. Undergraduate students enrolled in a general education PA class at a mid-western university participated in this study. Of the 161 students enrolled in the course, 55 volunteered for the online course ('web') and 106 remained in the traditional supervised course ('class'). The YMCA 3-Minute Step Test ('Step Test'), a measure of CRF, was used as a proxy to determine PA participation. The step test was administered during the third (baseline) and 15th week (endpoint) of the semester, with recovery heart rate (RHR) recorded after each test. The RHR scores from the baseline and endpoint step tests were compared to determine changes in fitness, and therefore, participation in PA. The male students in both the web and class group improved their CRF, and likely PA participation, from baseline to endpoint of the semester, regardless of course enrollment. The women in the web group also recorded an improvement in CRF and PA participation. The women in the class group, however, experienced a decrease in CRF, indicating a likely decrease in PA participation. Therefore, the online course seems to work better for improving PA participation (measured through changes in CRF) in female students, compared to the traditional supervised class setting. For male students however, the course type appears to have no effect on PA participation. Similar studies with larger sample sizes are needed to substantiate these results.

Key words: G*ender Difference, Cardiorespiratory Fitness, Recovery Heart Rate, Online Versus Traditional Wellness Courses.*

Introduction

Colleges today are faced with the changing landscape of course delivery methods, particularly finding a balance between online courses and traditional face to face courses. Over the past 10 years there has been a dramatic increase in the number of college courses offered online or via the web. The increase in online courses is being driven largely by student demand, as today's student is more comfortable and experienced receiving information through the internet than previous generations.[1] Students also mention convenience as one of the primary reasons for taking online courses, as this allows them to plan their academic pursuits around other activities including work, family, and social obligations.[2]

For students, the transition to college often poses many challenges, not the least of which is maintaining good health. Surveys report that many college students tend to engage in detrimental health practices, such as increased use of alcohol and tobacco, decreased use of preventive measures for sexually transmitted diseases, decreased physical activity, and poor dietary practices.[3-6] More than one third (35%) of college students are overweight or obese, and almost half (46%) report trying to lose weight through exercise or diet.[7] Colleges and universities realize they have a responsibility to promote healthy behaviors along with academic opportunities.

Given an increase in online learning and a decrease in PA, there may be an opportunity to blend college PA courses with online learning to increase PA in college students. In adults, websites and emails have recently shown to be effective for increasing knowledge or behavior towards PA.[8-13] Other areas of health promotion have also successfully used internet and email to increase health related knowledge or behavior.[14-15] Therefore, the purpose of this study was to determine if an online PA class could be as effective towards promoting PA as a traditional, face to face PA class. The paper explains the process used to develop the program including needs identification, academic development, and institutional development. The paper also addresses the implementation and evaluation processes.

Purpose of Study

The purpose of this study was to determine if an online PA class could be as effective towards promoting PA as a traditional, supervised PA class in college students.

Methods

Students were recruited into this study from a required PA and wellness course at a Midwestern university. The wellness course consisted of two components: A weekly 75 minute lecture on fitness and wellness habits and a weekly 50 minute, instructor-led, aerobic-based activity lab. Students in the course were approached during the first activity session of the semester seeking volunteers to complete the remaining activity sessions in an online format. Approval was granted by the Institutional Review Board and informed consent was given by each participant as required. There were 55 students who volunteered for the online course ('web') and 106 that remained in the traditional supervised class ('class'). There were no incentives to participate in either group, as all students were held to the same standards for course grading. Students in both groups attended the same weekly lecture. Students in the class group were required to attend a PA lab once a week in which they participated in a variety of aerobic-based activities lead by the course instructor. The class group was also required to perform PA on at least three other days of the week. Students in the web group were required to participate in their choice of physical activity(s) at least four days each week. The web students had access to the course instructor (MB) via Blackboard regarding frequency, intensity, duration, and mode of the activities, perceived exertion, and any other relevant course questions. Both groups of students were required to submit a weekly PA log describing their exercise mode, duration, heart rate, and rating of perceived exertion. Class students turned their logs in weekly to the activity instructor during the activity class; web students submitted their logs weekly through Blackboard. A single instructor (MB) was responsible for delivering all lectures and the course materials.

The purpose of this study was to compare the effect of a supervised PA class and an online PA class on students PA participation, which if improved, would also improve their overall health. Participation in PA increases individual levels of CRF, and CRF can be measured more objectively than self-reported PA. Therefore, changes in CRF were compared from the start and end of the semester to evaluate the effect of the PA course on student's health. In large populations, the YMCA step test is a popular, easy to administer, and reliable measurement of CRF. The

step test assesses the RHR of participants at the end of three minutes of rhythmic stepping, and those with the lowest RHR are considered to have the highest CRF.[16]

To assess CRF, each student performed the YMCA 3-Minute Step Test ('Step Test') during the third (baseline) and 15th week (endpoint) of the semester. There were no participants that dropped out of the course, therefore, all 161 participants are represented in both baseline and endpoint data. Students were instructed to step up and down on a 12-inch step for 3 minutes at a pace of 96 beats per minute.[16] The stepping pace was controlled by a mechanical metronome recorded onto a cassette tape. At the completion of stepping, subjects were requested to sit on their steps, at which time a trained staff member counted their radial pulse for one full minute to determine RHR. The RHR scores from the two step tests (baseline and endpoint) were used to determine changes in fitness.

Statistical analysis

Descriptive statistics of RHR scores of the two step tests were calculated separately for male and female students in both the web and class groups. The paired t-tests were done separately for each gender between baseline and endpoint for each group to determine whether the group had an effect in their RHR change. Repeated measures analysis of variance was done for each gender to determine the effect of group assignment or the effect of course activity to explain any change in RHR between the two step tests. All data were analyzed using SPSS (version- Release 14.0, 2004) software.

Results

The descriptive statistics of the students from the both online (web) and traditional supervisor-based class (class) is presented in Table 1 separately for both genders. To rule out any concerns regarding the difference in sample size between the males in the web (n=31) and class group (n=75), 31 scores were randomly selected from the class group and compared to the entire group. The results of the t-test did not show any significant difference between the two; therefore, the entire class group is reported in all analyses.

Regardless of their course enrollment, the male students decreased their mean RHR score from baseline to endpoint (109.35 bpm vs. 102.16 bpm in web group and 98.33 bpm vs. 93.53 bpm in the class group). The females students in the web group also showed a decrease in RHR score (110.38 bpm vs. 103.10 bpm), but the students in the class group saw in increase their RHR score from baseline (98.65 bpm) to endpoint (106.00 bpm). Subsequently the baseline and endpoint RHR scores have been compared for both groups separately for each gender. The differences between baseline and endpoint data of mean RHR scores were significant for males in web and class groups (paired-t = 2.36, $p = 0.03$, and paired-t = 3.21, $p = 0.002$, respectively). The differences between baseline and endpoint data of mean RHR scores was not significant among the female students enrolled in web group (paired-t = 1.57, $p = 0.132$) but the difference was significant among females in class group (paired-t = 2.21, $p = 0.034$). The changes in the mean value of RHR score from baseline to endpoint among the students of both courses have been presented in Figure 1, separately for each gender.

The results from repeated measures analysis of variance of RHR scores are presented in Table 2 to determine the differential effect of course enrollment and course activity on RHR scores in students of both genders. The results show that the variation of RHR in male students was significantly explained by their course assignment ($p = 0.01$). Moreover, regardless of course enrollment, the male students were able to change their RHR significantly ($p < 0.001$) as they moved from baseline to endpoint of the study. No significant ($p = 0.432$) interaction between males course enrollment and activity was found to account for the variation in RHR scores from baseline to endpoint data. The variation in RHR scores in female students was not found to be affected by their course enrollment. Furthermore, no significant independent-effect of course activity (i.e. difference between baseline and endpoint) ($p = 0.99$) was found in female students. However, the change in RHR scores was found to be significantly affected ($p = 0.01$) by an interaction between their course enrollment and course activity.

Discussion

The purpose of this study was to determine if an online PA class could be as effective towards promoting PA as a traditional, supervised PA class in college students. It has been well documented that significant physical and mental health benefits can be derived from regular participation in physical activity.[17] On the contrary, levels of PA show a decline upon high school graduation, and are considerably lower in college, with only about 40% of college students engaging in adequate amounts of

PA.[18-20] The many changes new college students face can cause great disruption to previously established routines and patterns, often making it difficult to schedule time for PA.[20]

Both Healthy People 2010 and Healthy Campus 2010 list PA as a leading national health indicator.[21] Specifically, Healthy Campus 2010 seeks to increase the proportion of college students who have received information on, and participation in, PA, and fitness. Nationally, universities and colleges recognize the importance of providing PA opportunities for students to help optimize their health and well-being. The general education course used in this study ('Concepts of Fitness and Wellness') is designed to address the HC 2010 objectives towards PA by using the reciprocal determinism model of the Social Cognitive Theory.[22] Within this conceptual framework, personal factors and environmental factors share a dynamic interaction towards influencing behavior change. This wellness course attempts to improve personal factors (cognitive, intellectual) towards healthy living by delivering a lecture-based course to all of the enrolled students. Conversely, the actual behavior of accumulating greater amounts of daily PA is enforced through the course activity labs, which, for this study, have been separated into class (supervisor-based group activity sessions) and web (self-paced activities). Therefore, the environmental factor in the reciprocal determinism model has been manipulated to assess the efficacy of each (Figure 2).

Academic departments that deliver PA courses are challenged with improving student's physical health. With the dramatic decline in PA noted after high school, this challenge could seem daunting. However, given that students have become more likely to choose courses based on convenience, the opportunity to offer PA classes through an online format is appealing. Although the efficacy of online PA courses in college students has not yet been measured, there have been successful health related programs for adults. Fox et al used daily email reminders to prompt women to take their oral contraceptive, with those receiving the prompts reporting much higher compliance and expressing the desire to have the prompts continue even after the study ended.[23] Specific to PA, bi-weekly email prompts have been used to attenuate the wintertime decrease in physical activity in worksite employees.[13]

Two main issues of concern in self-paced PA programs are adherence of activity and maintenance or improvement of fitness. Previous research in adults has compared home-based programs to supervised group-based programs, with home-based programs producing higher rates of exercise adherence and equivalent fitness outcomes.[24-27] This is analogous to comparing an online college PA class and a face to face college PA class. To date, though, there has been little research comparing the two.

The results herein show that regardless of course enrollment (web or class), the RHR of male students improved from baseline to endpoint, indicating an improvement in CRF. However, the RHR score of male students in the class group was lower than male students in the web group at baseline and endpoint, indicating better CRF of the students enrolled in class group. The RHR change of the female students, unlike their male counterparts, was noticeably different based on their course enrollment. Similar to the males, the females in the web group experienced a decrease in RHR over time, or improved CRF. The females in the class group, however, saw their RHR increase over time, indicating a decrease in CRF.

The result of the present study points out a few important observations on the outcome of college PA courses. The higher mean baseline RHR scores of both genders that volunteered themselves for the online class may be indicative of a preference for students with lower CRF to avoid group-based activity classes. Encouraging, however, is that both males and females in the web group showed improvement in their CRF by the end of the semester. Second, male students showed improved CRF over the duration of the semester regardless of enrollment in the web or class group. This implies that the course delivery mechanism may be unimportant to male students, or males appropriately self-select into the course that best fits their personal needs. Third, a gender difference is noticed among the class group as the CRF of the males improved while the females decreased, which is an unfortunate outcome in a PA course. One possible explanation to this unusual finding may be the gender breakdown of the course. The traditional activity course, or class group, was about 75% male students, putting the females in a noticeable minority. In a male dominated activity class, the female students may feel inhibited about expressing their needs and desires for physical activities appealing to them. In a qualitative study, Sullivan described that shy, reserved students tend to feel more inhibited in the classroom, yet this inhibition is lifted during an online course.[2] Therefore, in the environment of a male dominated physical activity class, female students may not be comfortable expressing their physical activity needs. If so, their level of enthusiasm in the group activity, and their enthusiasm for further weekly PA, may be

muted. This might then explain the drop in CRF noted for class group females. The females in the web-based course, however, showed no significant change in CRF, with a trend towards improvement. This presents a positive contrast to the declining CRF of the females in the class group. The improved CRF in the web-based females may be partly explained by them being able to choose their physical activities based more closely on their own personal needs.

Therefore, two conclusions may be drawn from the results of this study. First, online physical activity courses are at least as effective as traditional face-to-face courses for improving CRF, and likely PA participation, in male students. Second, female students show a better response in CRF and PA participation in a web-based course compared to a traditional face-to-face course, possibly due to the individual physical environment instead of the male dominated class environment. To date, there has been little research on comparing changes in CRF between online and traditional college PA classes. The present study is one of the first to compare the two course delivery formats over the length of a semester using an objective measure of CRF.

Limitations to this study include the small sample size and the obvious gender discrepancy of the participants. Although the gender ratio is fairly representative of this particular university, it may not be generalizable to the majority of universities that typically have more female than male students. Also, CRF is only one aspect of fitness, so it is unknown what effect the web and class formats would have on flexibility, muscle endurance, muscle strength, and/or body composition. Finally, this study was conducted during spring semester and the majority of students were freshman. Fall semester and upper class students might show a different pattern of change in CRF.

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Table 1. Descriptive statistics of recovery heart rate (bpm) of the students in 'web' and 'class' group and their comparison using paired-t test

Gender	Course		RHR - baseline		RHR - endpoint		Baseline vs. Endpoint		
		N	Mean	SD	Mean	SD	Paired t	df	p
Male	Web	31	109.35	17.60	102.16	14.46	2.36	30	0.025
	Class	75	98.33	15.06	93.53	15.87	3.21	74	0.002
Female	Web	21	110.38	24.45	103.10	24.23	1.57	20	0.132
	Class	34	98.65	20.04	106.00	19.64	2.21	33	0.034

Table 2. Repeated measures analysis of variance of RHR scores to determine the effect of course and activity

Gender	Analysis of variance	df	Mean Sum of Square	F	p
Male	Between Group-				
	Course	1	4234.37	10.88	0.01
	Error	104	389.25		
	Within group-				
	Activity	1	1577.55	15.60	<0.001
	Activity * Course	1	62.83	0.62	0.432
	Error	104	101.10		
Female	Between Group-				
	Course	1	505.99	0.69	0.410
	Error	53	734.54		
	Within group-				
	Activity	1	0.029	0.00014	0.990
	Activity * Course	1	1390.94	6.860	0.011
	Error	53	202.76		

Figure 1. Changes in the RHR scores between baseline to endpoint data in male and female students enrolled in both 'web' and 'class' courses

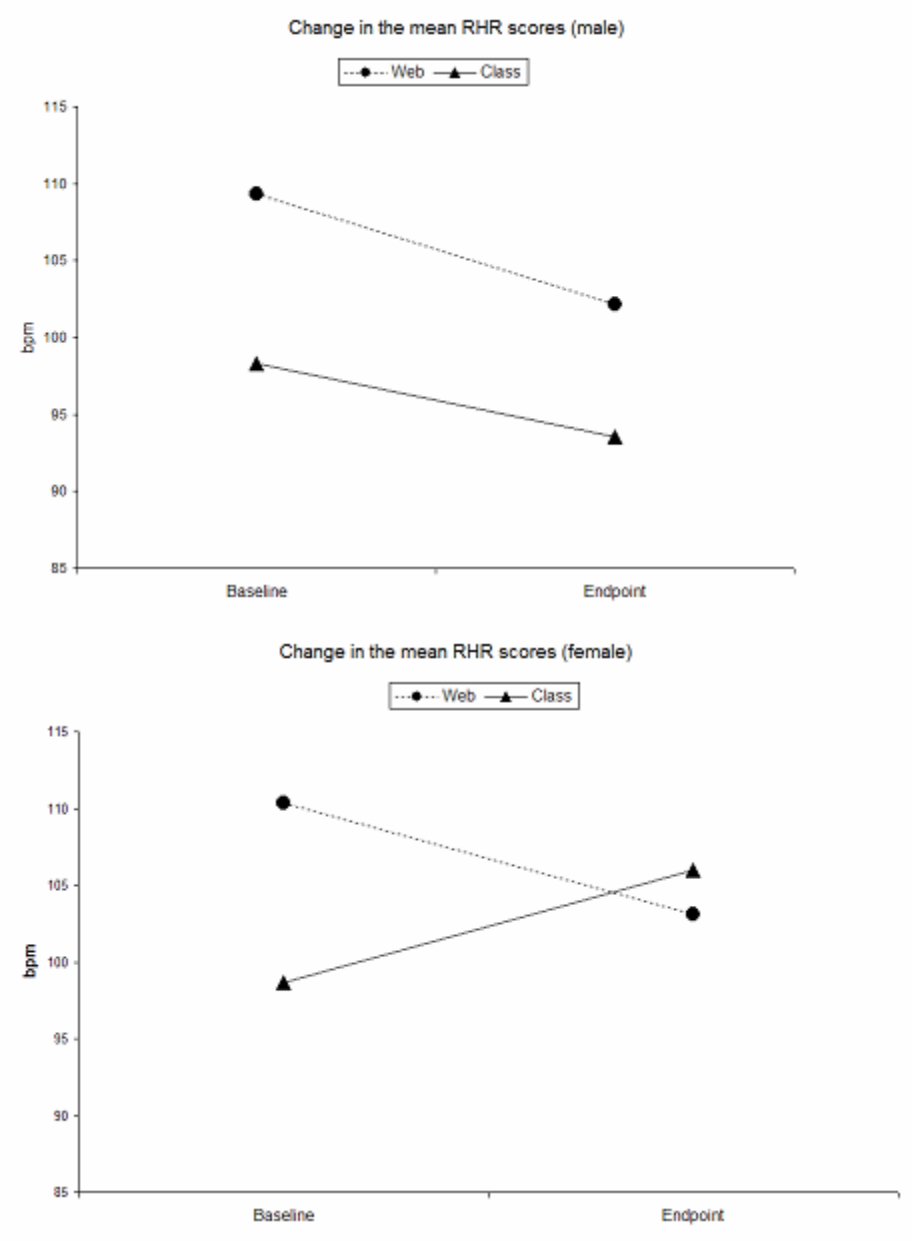

Figure 2. Schematic representation of the reciprocal determinism model as it applies to increasing physical activity (PA) in the Concepts of Fitness and Wellness course