Health-Related Fitness Knowledge and its Relation to Student Physical Activity Patterns at a Large U.S. Southern State University

by Xiaofen D. Keating, The University of Texas at Austin; Jose Castro-Piñero, The University of Cadiz; Erin Centeio, Louis Harrison. Jr., Tere Ramirez, The University of Texas at Austin; Li Chen, Delaware State University

Abstract

This study examined student health-related fitness (HRF) knowledge and its relationship to physical activity (PA). The participants were undergraduate students from a large U.S. state university. HRF knowledge was assessed using a test consisting of 150 multiple choice items. Differences in HRF knowledge scores by sex, ethnicity, and years in university were examined by ANOVA. The mean HRF knowledge test score of students was 58 out of 150 points. No significant HRF knowledge differences were found by PA levels, sex or by years in university. In conclusion, many university students have yet mastered an adequate amount of HRF knowledge and no significant relationship between HRF knowledge and PA was found.

Key words: college students; exercise behaviors

Introduction

Health problems associated with obesity and physical inactivity are widely acknowledged and over the past 30 years have become a serious public health concern (U.S. Department of Health and Human Services [USDHHS], 2001). While various interventions have been implemented in all levels of society such as family, school, community, and state (Anderson, Konz, Frederich, & Wood, 2001; Shaya, Flores, Gbarayor, & Wang, 2008; Siegel, Prelip, Erausquin, & Kim, 2010), recent data indicate that significant declines in obesity and increases in physical activity (PA) remain to be seen (Wang & Beydoun, 2007). In order to reverse the seemingly unstoppable prevalence of obesity, public health groups have called for more continuous and intensified promotion of PA in the general population (The Robert Wood Johnson Foundation [RWJF], 2009; USDHHS, 2009).

While it has been realized that PA interventions are needed at all age groups (USDHHS, 2000), studies suggest that young adulthood is a critical time for PA interventions due to carry-over effects of PA patterns which may last for a lifetime (Centers for Disease Control and Prevention [CDC], 2007; Dart & Davis, 2008). As a large segment of young adults, university students have also been identified as a unique group for targeted interventions, because they often make decisions about their lives and behaviors for the first time on their own and live on campus (Keating, Guan, Haung, Deng, Wu, & Qu, 2005; McArthur & Raedeke, 2009). In order to respond to the call for PA promotion, the leading health group in higher education °V the American College Health Association [ACHA] has diligently promoted PA on campuses across the nation (ACHA, 2002). University students, unfortunately, continue to exhibit poor health outcomes because empirical research has found that one to two thirds of university students are physically inactive (Boyle & LaRose, 2008; Cardinal, Tuominen, & Rintala, 2004; Dart & Davis, 2008; Keating, Guan, Pinero, & Bridges, 2005; McArthur & Raedeke, 2009; Staten, Miller, Noland, & Rayens, 2005). Compared to those young adults who are not in higher education, university students usually have access to gymnasia and fitness centers on campus (Miller, Noland, Rayens, & Staten, 2008). Studies have reported, unfortunately, that university students have not participated in significantly more PA than young adults who are not students (Keating, Guan, Pinero et al., 2005; Jones et al., 1998; USDHHS, 2000), indicating that individuals will not increase their PA simply because of proximity to PA facilities. The low level of student PA calls for more effective PA interventions in higher education settings (Sparling, 2003). Aside from the general PA level among university students, frequently investigated determinants of PA often include sex, age, ethnicity, and class standing (Harbour, Behrens, Kim, & Kitchens, 2008; Keating, Guan, Pinero, et al., 2005; Nahas, Goldfine, & Collins, 2003; Sullivan et al., 2008). Interestingly, while millions of American youth have participated in interscholastic sports (Lee, Burgeson, Fulton, & Spain, 2006), the influence of sport participation history on university student PA has not been thoroughly explored (Taliaferro, Rienzo, & Donovan, 2010).

It is important to point out that student health-related fitness (HRF) knowledge mastery has consistently emerged as one of the important areas that needs improvement (Keating, Harrison, Chen, Xiang, Lambdin, Dauenhauer et al., 2009; Stewart & Mitchell, 2003). The role of HRF knowledge in PA promotion can be clearly explained by the theory of planned behavior (TPB) (Ajzen, 1991). According to the TPB, an individual's intention to participate in PA is the immediate predictor of PA. There are three determinants in TPB: (a) attitude, which consists of affective (e.g., like PA vs. dislike) and cognitive (e.g., PA is harmful vs. beneficial) components; (b) subjective norm, which is related to the perceived social pressure that individuals may feel to engage or not engage in PA; and (c) perceived behavioral control, which is the perceived ease or difficulty of involving oneself in PA. The importance of PA knowledge to PA engagement lies in its relationship with the attitude component in TPB. Specifically, knowledge has an impact on attitudes, which, in turn, influence intentions toward behavior (Spiegel & Foulk, 2006). Given that it has been suggested that knowledge of PA and its health benefits is the foundation for people to engage in more PA (Kahn et al., 2002; Kulinna & Silverman, 2000), improving and developing mastery of HRF knowledge might be the first step to the establishment of healthy PA behaviors (Castelli & Williams, 2007; Keating Harrison, Jr., Chen et al., 2009; Zhu, Safrit, & Cohen, 1999).

A number of researchers (Corbin & Cardinal, 2008; Williams, Papandonatos, Napolitano, Lewis, Whiteley, & Marcus, 2006) have suggested that fitness related courses offered by universities are extremely important to general students as they often counterbalance many of the negative lifestyle experiences

associated with typical university settings, including a busy routine schedule, hectic social lives, and stressful academic learning (Reed & Phillips, 2005; Vickers et al., 2004). Logically, increasing student HRF knowledge mastery should be one of the approaches used to promote PA among students on campus, owing to the educational nature of universities. However, no empirical data have supported the above contention (Budd & Volpe, 2006; Kropski, Keckley, & Jensen, 2008). In fact, there is a lack of understanding about the sustainability and efficacy of different types of PA interventions across the board (Keating, Guan, Pinero et al., 2005; Sparling, 2003). The gap between our theoretical understanding about the role of HRF knowledge in promoting PA and the lack of supporting data hinders the efficacy of PA promotion endeavors. Therefore, as suggested by some researchers (Keating, Chen, Guan et al., 2009; Stewart & Mitchell, 2003), it is necessary to fully investigate the relationship between HRF knowledge and PA behaviors.

In order to help us understand research on HRF knowledge, the current status of the validity and reliability of HRF knowledge tests is of concern. It is unquestionable that the validity and reliability of HRF knowledge tests for university students are keys to the quality of studies on the topic as scientific findings can only be made using valid and reliable data (Keating, Chen, Guan et al., 2009). Otherwise, our conclusions about the role of HRF knowledge in changing PA behaviors might be misleading. As reported in previous studies (Keating, Guan, Pinero et al., 2005; Stewart & Mitchell, 2003), there is a lack of valid and reliable HRF knowledge tests for students in general, even though many studies have used numerous HRF knowledge tests in university settings. Furthermore, the development of HRF knowledge for university students has not been updated to reflect our most recent understanding of the matter (Keating, Chen, Guan et al., 2009). As a result, it is difficult to track and compare university student HRF knowledge mastery using results reported by different studies.

Information about the relationship between the HRF knowledge and PA levels could help us understand why HRF knowledge has not played a prominent role in PA interventions. This information would also be used to identify what should be included in HRF education (Carlson, DeJong, Robison, & Heusner, 1994). In addition, understanding the role of HRF knowledge in the establishment and maintenance of habitual PA behaviors could provide guidance for PA interventions among university students. This study is significant as it has the potential to extend existing research on the association between HRF knowledge and PA. Therefore, this article aims to examine student HRF knowledge, and the relationship between HRF knowledge and PA levels among students at a large southern state university in the U.S. The secondary purpose of the study is to examine student HRF knowledge differences in sex, ethnicity, class standing, and history of sport participation.

Method

Participants

Human subject approval was granted by the university in which the study was conducted before any data were collected. Undergraduate students (n = 148) from nine upper level undergraduate classes at a large Southern state university participated in the study in the spring semester of 2009. Class sizes varied from 15 to 100 students. The majority of the participants were females (i.e., 73.6%). The mean age of participants was 21.09 (*SD* = 3.8). The percentage of Whites, Blacks, Latinos, and Asians was 46.6%, 21.9%, 19.6%, and 12.8%, respectively, which was reflective of the student body at the university. There was a relatively equal number of students by class standing. Refer to Table 1 for detailed demographic information.

Table 1. ***Participants' Demographic Information***

Variables	Mean (SD)	Frequency (%)
Age	21.09(3.8)	
Sex		
Female		109(73.6%)
Male		39(26.4%)
Ethnicity		
Whites		69(46.6%)
Blacks		31(21.9%)
Latinos		29(19.6%)
Asians		19(12.8%)
Year in college		
1st year		32(21.6%)
2nd year		36(24.3%)
3rd year		42(28.4%)
4th year		38(25.7%)

Measures

Student HRF knowledge, PA, and general demographic data were needed based on the objectives of the study. All measures were self-reported. The HRF knowledge test, weekly leisure-time exercise questionnaire (LTEQ), and common demographic questions were put together as a paper-pencil survey.

HRF knowledge. Student HRF knowledge was measured using a HRF knowledge test developed by Keating and colleagues (Keating, Chen, Lambdin, Harrison Jr., & Ramirez, 2009). The test was designed to measure the following 10 content domains: basic HRF and PA concepts, basic physiological responses to PA, basic nutrition concepts, HRF and PA assessment, individualized PA prescription, nutrition assessment, safety and injury prevention, stress management, weight management, and self-management skills for PA adherence. The content domains and the items used to reflect the domains were generated by the investigators based on content examination of HRF textbooks published for college students in the most recent five years. Then a panel of experts (*n* = 14) in the fields of fitness and physical education were asked to assess the appropriateness of the domains to ensure content validity. In addition, the experts were also asked to weigh the importance of each domain using a 10-point Likert scale with 1 and 10 for the most and least important content, respectively. The results of experts' weighting indicated that all 10 domains were equally important. Therefore, there were 150 multiple choice questions with 15 questions for each domain and one point was assigned to each question. The questions were then mixed randomly to form a knowledge test. The maximum score for the HRF knowledge was 150. Students needed about 35 - 40 minutes to complete the test.

It is important to ensure that the knowledge test has acceptable reliability and validity. The HRF knowledge test was believed

to be valid and reliable for the following reasons: (a) it was developed under the guidance of psychometric theories; (b) its 10 content domains were validated by a panel of experts in the fields of fitness, health education, and physical education, reflecting the most recent understanding of the needed HRF knowledge for university students; and (c) the test uses a number of multiple choice questions to assess student knowledge about each content domain. Thus, the reliability of the test is higher than those which only use a small number of questions in a limited number of domains (Keating, Chen, Guan et al., 2009).

PA measures. PA data were measured by the LTEQ developed by Godin & Shephard (1985), which focuses on measuring weekly PA patterns, including both PA events and amounts at various intensities. Commonly performed exercises were grouped into three categories: strenuous/vigorous (VPA), moderate (MPA), and mild/light exercise (LPA). Participants are also asked to specify the PA events they usually engage in by checking them from a list of the most often participated PA events. The scale has an "other" option for each category so the participants can add PA events that are not listed in the scale. The LTEQ has been widely viewed as reliable and valid given that a number of studies have used the LTEQ to assess PA patterns (Keating, Guan, Pinero et al., 2005; Levy & Cardinal, 2006; Reed & Phillips, 2005; McArthur & Raedeke, 2009; McCormack, Spence, Berry, & Doyie-Baker, 2009; Spink & Nickel, 2010). The original version of the scale asks participants to report the frequency of PA events lasting 15 minutes or longer during a typical week. The scale was modified to 30 minutes or longer during a typical week in order to reflect the most recent understanding about the need for adequate amounts of PA (USDHHS, 2009). Four PA variables were used with three independent PA variables -- VPA, MPA, and LPA, and one combined PA variable -- total PA (TPA). Because PA with different intensities cannot be simply summed, the commonly used method of converting days of PA with various intensities into metabolic equivalent (MET) was employed (Levy & Cardinal, 2006; McArthur & Raedeke, 2009). Specifically, LPA, MPA, and VPA was the sum of days of LPA*3, MPA*5, and days of VPA*9, respectively, while TPA was the total sum of LPA, MPA, and VPA. A total of 30 METs, which is equal to six days of engagement in MPA weekly, was considered adequate involvement in PA using the most recent PA recommendation (USDHHS, 2009).

Demographic information. The most commonly examined demographic data about college student samples were collected. The variables were age, sex, ethnicity, and class standing. One question regarding student history of sport participation was also included in this section.

Data Collection

A convenience sample was used in the study in order to generate a relatively large sample size. Instructors known by the investigators were asked by email if they were willing to let their students participate in the study. Once agreed, the senior investigator who was not the instructor for any of the selected classes (i.e., elementary education teaching methods, introduction to sports history, early child development, fitness and nutrition, and children's movement) administered the survey 40 minutes before the end of class.

Data Analyses

Data screening was conducted before any analyses were performed. In total, 38 surveys were eliminated from the data set due to excessive missing data (i.e., missing more than 50% of the total values). According to Meyers and colleagues (Meyers, Glenn, & Guarino, 2006), statistical assumptions for ANOVA (i.e., no univarite outliers, univariate normality, and homogeneity of variances) and MANOVA (i.e., no multivariate outliers, multivariate normality, and homogeneity of covariance matrices) were examined. Specifically, univariate and multivariate outliers were detected by examining the Box plots and the Mahalanobis distance [MD] (i.e., MD < 3), respectively. Normality assumption was not violated because both skewness and kurtosis values were smaller than 1.0 (Meyers et al., 2006). Levene's test and Box's test were performed to test the assumptions of homogeneity of variances and homogeneity of covariance matrices for ANOVA and MANOVA, respectively. Both test results were not significant, indicating that the assumptions were met. Then descriptive analyses for all variables (i.e., means and standard deviations, and frequencies) were calculated. Because the age variation was very small (see Table 1), this variable was not analyzed. The correlation between total HRF knowledge score and TPA was computed to examine the relationship between the two variables. Independent t-test was employed to examine HRF knowledge differences in sex and history of sport participation. Simple MANOVA was used to test HRF knowledge differences by the three PA variables (i.e., LPA, MPA, and VPA). Univariate analyses were performed for significant MANOVA results. In addition, a 2 (i.e., sex) by 4 (i.e., ethnicity) ANOVA was employed to explore differences in HRF knowledge. One-way ANOVA was conducted to test HRF knowledge differences in years in university. Tukey post hoc test was performed for significant ANOVA. All the data analyses were completed using SPSS 18.0 (SPSS Inc., 2009). For significant results, effect sizes were calculated (Meyers et al., 2006). The partial eta squared (i.e., η^2), which is the proportion of total variance that is attributed to an effect, was used to assess the effect size for the *F* statistics. The cut-off values of η^2 for small, medium, and large effect size were .01, .09, and .25, respectively (Cohen, 1988). Significance was set a priori at an alpha-value of less than .05.

Results

Relationship between HRF Knowledge and PA

Correlations between the HRF knowledge and the amount of PA. The average HRF knowledge score was 58.05 (SD = 28.96) out of 150 total points. The correlations between HRF knowledge and TPA, LPA, MPA, and VPA were .11, .14, .06, and .07 respectively, indicating low correlations among those variables. Of more importance, none of the correlations was significant. The MANOVA result revealed that there were no significant HRF knowledge differences in LPA, MPA, and VPA [Wilks' Lambda = .14, $F_{(3, 6)} = .79$, $p > .05$].

HRF Knowledge Differences in Sex, Ethnicity, Years in University, and History of Sport Participation

Detailed information about HRF knowledge differences in sex, ethnicity, years in university, and history of sport participation is

presented in Table 2. No sex differences were found. Regarding knowledge differences by ethnicity, Latino students had the highest HRF knowledge score of all ethnic groups. The result of ANOVA indicated that there was a significant HRF difference by ethnicity [$F_{(3, 148)} = 3.80$, $p < .01$] with a small effect size (i.e., $\eta^2 = .08$). The post hoc test suggested that Whites had significantly higher knowledge scores than African Americans and Asians, and lower scores than Latinos. There were no knowledge differences between African Americans and Asians. The one-way ANOVA revealed that there was not a knowledge difference in years in university [$F_{(3, 147)} = 1.59$, $p > .05$]. In addition, independent t-test indicated that the HRF knowledge difference in history of sport participation was not significant ($t_{129} = -.65$, $p > .05$).

Table 2. ***Means and Standard Deviations of HRF Knowledge***

Variables	Mean (SD)
Sex	
Female	59.40(28.25)
Male	54.26(30.93)
Ethnicity	
Whites	60.74(30.09)*
Blacks	44.77(24.11)
Latinos	73.59(24.94) **
Asians	46.21(25.03)
Year in university	
1st year	66.66(24.56)
2nd year	52.25(24.50)
3rd year	55.36(31.96)
4th year	59.26(31.96)
History of sport participation	
No	58.20(27.94)
Yes	61.61(30.01)
Note: * p < .05	—
* * p < .01	

Discussion

According to the social cognitive theory (Bandura, 1997, 2001) and the TPB (Ajzen, 1991), the occurrence of a volitional behavior is not isolated. Personal, environmental, and behavioral factors reciprocally influence each other, with more weight on the impact of the cognitive processes, indicating that knowledge related to corresponding behaviors plays a critical role in the establishment and maintenance of such behaviors. Therefore, it is logical to assume that a great deal of effort must be invested in increasing student HRF knowledge in order to increase PA among students. Unfortunately, to date, our understanding about HRF knowledge and PA behaviors is very limited andη many universities have not implemented effective interventions to reduce sedentary behaviors on campus. This line of research warrants more attention of professionals in the fields of health, fitness, and physical education (Keating, Chen, Guan et al., 2009).

The study was designed to investigate university students' HRF knowledge and its relationship to student PA behaviors. The results of the study would enrich our understanding about the relationship between PA participation and HRF knowledge. In addition, the current results could shed light on future research on the topic. Overall, there are five findings worth noting. First, consistent with previous research (Keating, Chen, Guan et al., 2009; Keating, Guan, Pinero et al., 2005), students in the study also did not master an adequate amount of HRF knowledge. Second, no significant correlation has been found between student HRF knowledge and their PA levels. Third, there is not a significant HRF knowledge difference in years in university, indicating that student HRF knowledge did not change as their years in university increase. Fourth, PA differences in history of sport participation were significant. Early engagement in sports might be an effective intervention to promote PA in the population. And fifth, the discrepancy in HRF knowledge among ethnic groups was significant. Strategies with ethnic sensitivity are needed to bridge the gap among different ethnic groups.

HRF Knowledge and the Correlation between HRF Knowledge and PA Levels

HRF knowledge. In line with previous research (Keating et al., 2005), the present study found that most students did not demonstrate mastery of an adequate amount of HRF knowledge. Unfortunately, there are no data available to explain why students have not possessed the needed knowledge to be physically active after the ACHA has diligently promoted PA on campus for almost a decade (ACHA, 2002). While it is not the purpose of the study to examine what PA interventions have been implemented at the university, an examination of undergraduate student documents indicated that the university has not used its educational setting to require students to take HRF courses to ensure that students possess the needed knowledge and skills. Combined with findings reported by previous studies (Keating et al., 2010), it seems that research on the topic has repeatedly reported the same result that college students lack a minimum amount of HRF knowledge. It is disheartening that universities have not been able to improve this situation. Many universities have required undergraduate students to take at least one credit unit for conceptual physical education for their general education (Corbin & Cardinal, 2008; Rogers, 2003) and this type of course has resulted in significant PA improvement and knowledge (Adams, Graves, & Adams, 2006; Cardinal, Jacques, & Levy, 2002; Cardinal & Spaziani, 2007). Hence the university probably should consider requiring undergraduate students to take a conceptual physical education course in order to promote PA among students.

HRF knowledge and PA levels. Given that HRF knowledge and PA are theoretically known to be related (Keating, 2003; Zhuo et al., 1999), the low and non-significant correlation between the two variables was unexpected. To our knowledge, there are few studies examining HRF knowledge and PA simultaneously among university students. Hence, it is difficult to explain why we failed to find a significant relationship. Obviously, the data from the study might be interpreted to mean that student PA levels are not primarily driven by their HRF knowledge. Students in young adulthood usually do not have many health problems, so they probably do not have overriding concerns about their health or health-related PA. As a result, their HRF knowledge is not strongly correlated to their PA. It might be possible that university student PA is determined by other factors such as the effect of PA on appearance or social

aspects of participating in PA. The influence in HRF, which was found to be significant in influencing PA in other studies, may be more important for different age groups, as the motivational factors for PA and exercise may change with age. On the other hand, considering that most participants in the study did not score high on the knowledge test, caution is needed when interpreting the result. It is premature to draw any conclusion between the two variables when most students have very limited HRF knowledge. Our understanding about the relationship between the two variables will be enriched when participants have truly mastered the needed knowledge. More research on the topic is needed in the future.

HRF Knowledge and PA Differences in Sex, Ethnicity, Years in University, and History of Sport Participation

Sex. In spite of conflicting findings, many studies have reported that sex is a factor influencing student PA levels (Grespo, Smit, Andersen, Carter-Pokras, & Ainsworth, 2000; Keating, Guan, Pinero et al., 2005; McArthur & Raedeke, 2009). As noted earlier, it is widely believed that the more HRF knowledge an individual has, the more likely that he or she would engage in more PA (Zhu et al., 1999). Because there was a significant TPA difference in sex (see Table 3), logically, it was expected that there must also be a difference in HRF knowledge. The study, however, did not support the assumption. Given that few studies have examined this issue thoroughly, no sufficient information is available to explain the reasons for the above finding. This is probably due to the nature of knowledge, which is cognitive, and both male and female students could gain the same amount of HRF knowledge. The result is important and useful as it can shed light on our understanding about student PA determinants, suggesting that PA differences in sex might not be caused by HRF knowledge discrepancy.

Ethnicity. Health disparity among ethnic groups has been of concern as some groups have suffered more severe health problems than others (USDHHS, 2000). Many studies have suggested that there is a need to bridge the health gap among ethnic groups (USDHHS, 2001, 2009). It is encouraging that Latinos had the highest average score of HRF knowledge. African Americans and Asians, however, still remain the groups with the least amount of HRF knowledge as reported in the literature (Keating, Chen, Guan et al., 2009). Furthermore, African Americans and Asians have also been found to have the least amount of HRF knowledge in K-12 programs (Keating, Chen, Guan et al., 2009), suggesting these two ethnic groups need interventions at all levels. Interestingly, however, there were not significant TPA differences among all ethnic groups, even though Asians had more LPA and MPA. The inconsistent finding between HRF knowledge and PA in ethnicity warrants more research in the future.

Class standing. The potential of higher education in helping university students adopt a healthy lifestyle has been well documented (ACHA, 2002). Information concerning changes in student HRF knowledge and PA during years in university is important for understanding effects of higher education on physically educating future citizens. Surprisingly, few studies on the topic have been found in the literature, even though there is a handful of research on college student PA transitional shifts (Levy & Cardinal, 2006). To a certain degree, effects of higher education in ensuring students master adequate amount of HRF knowledge and in promoting PA are unknown. Using a cross sectional research design, the study data provided preliminary information about HFR knowledge and PA changes in class standing. It is discouraging that both HRF knowledge and PA did not change as students' years in university increased. Students in the study performed poorly on the test in general despite the presence of many university professionals in the fields of health, nutrition, and physical education. Thus, it is puzzling why the university has not managed to ensure that students have mastered the necessary HRF knowledge. In terms of PA changes, considering that students usually spend four years on campus and the university is equipped with state of the art PA facilities, and an outstanding athletic dept, the university should have effectively helped students increase their PA level. The data from the study suggest that there is a need for the university to implement more effective interventions to improve student HRF knowledge and PA.

History of sport participation. Millions of American youth have participated in organized sports (Alfano, Klesges, Murray, Beech, & McClanahan, 2002; Taliaferro et al., 2010). As noted earlier, few studies exist that explore how history of sport participation is related to HRF knowledge mastery and PA levels (Taliaferro et al., 2010). As might be expected, this study found that there was a significant TPA difference by history of sport participation, which is in line with past research on the topic (Taylor, Blair, Cummings, Wun, & Malina, 1999; van Mechelen, Twisk, Post, & Kemper, 2000). The data from the study supported the importance of childhood sport participation in helping young adults develop lifetime habitual engagement in PA. Therefore, American youth should be strongly encouraged to take part in any forms of sports as early as possible. No significant relationship between HRF knowledge and history of sport participation was found, however. The result that history of sport participation was related to PA but not HRF knowledge may be explained by the following reason. It may be because PA is a learned behavior and those who were engaged in sports developed a habitual pattern of PA participation. Although students may learn some HRF knowledge while being involved in sports, they need to purposely learn more comprehensive HRF knowledge, given that the content of the knowledge test was related to all the knowledge needed to adopt healthy lifestyles. Moreover, it is important to note that the study did not address how types of past sport participation were associated with PA and HRF knowledge. It is possible that some types of sports participation such as individual sports may show stronger relations to PA and HRF knowledge. Future research should investigate the prospective associations between history of sport participation and university students PA and HRF knowledge via a randomized research design with a larger sample size.

Limitations

There are some weaknesses in this study that need to be noted. First, like most survey studies, the data were self-reported and it is well documented that participants tend to over-report PA (McArthur & Raedeke, 2009). Second, random sampling was not used and this study may suffer from participant selection bias. Considering the fact that the participants were a convenience sample representing a small population of students at the university, this research cannot be assumed to have external validity for all university students. And finally, the percentages of males and females were not even.

The results of the study might be greatly influenced by females' data. Caution needs to be exercised when generalizing the results of the study to its population.

Summary

The study found that most students did not have mastery of an adequate amount of HRF knowledge. The correlation between HRF knowledge and TPA was low and not significant. In addition, student HRF knowledge and PA did not change significantly as their years in university increased, indicating that the university has not been able to physically educate the students well. Ethnic differences in both HRF knowledge and PA were found and Whites were the only ethnic group which had more HRF knowledge as well as PA while African American students had the least amount of HRF knowledge and PA among the ethnic groups. No relationships between sex or history of sport participation and PA differences were found. More studies are needed to further examine the relationship between HRF knowledge and PA behaviors.

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