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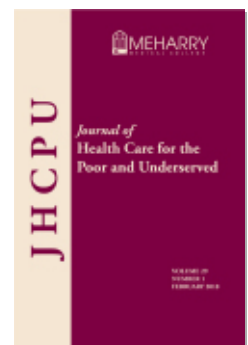
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# Effectiveness of a Retention Program to Improve Performance During the First Semester of a Doctor of Physical Therapy Program

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**Abstract: Background.** To meet the expanding need for physical therapists universities are under increasing pressure to enroll, educate, and train physical therapists. Poor academic performance can result in student dismissal from a physical therapy program. The purpose of this study is to determine if implementation of a retention program would improve student academic performance in the foundational science curriculum in a physical therapy program. **Methods.** A prospective observational cohort design was used. The retention program centered on three approaches: 1. Early identification of at-risk students. 2. Supplemental instruction in Human Anatomy. 3. Offering peer tutoring for the foundational science courses. **Results.** A significant association existed between the implementation of the retention program and the reduction of dismissals from the Fall Semester of 2012 to the fall 2013 semesters. **Conclusion.** Implementation of a retention program had a beneficial effect on decreasing student dismissals in a physical therapy program.

*Key words:* Physical therapy, education, academic dismissal, remediation.

The implementation of the Patient Protection and Affordable Care Act (PPACA) of 2010 and expansion of health care coverage to millions of additional Americans, if the program survives Congressional efforts to repeal it in whole or in part, is expected to increase the overall shortage of all available health care providers.<sup>1</sup> According to Song et al., the United States primary health care system is in crisis as a result of the ongoing shortage of providers and increased access to health care as a result of the PPACA.<sup>2</sup> The impact of this shortage has an even greater effect on underserved populations, whose circumstances are embedded in a long history of impeded access to health care.<sup>3,4</sup> According to Rabinowitz et al., “The shortage of physicians providing primary care to underserved populations has been one of the most intractable U.S. health policy problems of the past century . . .”<sup>5</sup>[p.1225] The shortage in health care providers has had a particularly negative impact on the African American community. Komaromy et al. reported less access and poorer outcomes for African Americans as compared with

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non-Hispanic White patients.<sup>6</sup> Recruiting and training more health care providers from underserved populations has been identified as a potential means of increasing the supply of primary care providers available to these populations.<sup>5,6</sup>

One of the ways that educational institutions can help decrease shortages in health care providers is by reducing student attrition. The estimated attrition rates for physical therapy programs is 5%, medical schools 17–19%, and nursing programs greater than 20%.<sup>7</sup> Rittenhouse et al. reported an average attrition rate of 13% among accredited or approved health professions' education programs.<sup>8</sup> Higher attrition rates for students from underserved populations are likely to make yet more elusive the goal of increasing the total number of providers from this group, especially in light of the historically low rates of enrollment and graduation for these populations.<sup>9–11</sup>

Researchers have evaluated different strategies to improve student retention and academic performance in health professions programs. Johnson et al. investigated the importance of early identification of students who were at risk of academic difficulty in health sciences programs.<sup>12,13</sup> These researchers found that early intervention through the use of a screening survey facilitated the implementation of specific interventions aimed at reducing student attrition in a nursing program.<sup>13</sup>

Supplemental instruction has been employed by health care educational institutions to improve student performance.<sup>14</sup> Maize et al. described supplemental instruction as “. . . a proactive support system developed to increase the academic success of students at the point of trouble instead of waiting until the end of the semester when it is too late.”<sup>14(p.4)</sup> Several authors have reported the positive effect of supplemental instruction on academic performance in general student populations.<sup>15,16</sup> In these studies high-achieving students were used to lead supplemental voluntary class sessions for students whom faculty identified as being at high risk for academic difficulty.

Another approach that has been taken by health care educational institutions is peer tutoring. Peer tutoring involves students taking an instructional role, outside of the classroom, with fellow students who are experiencing difficulties with specific aspects of a particular curriculum. Peer-tutoring provides an effective environment for communication about course material that students find challenging.<sup>17</sup> This is particularly beneficial when poor communication between student and instructor is a contributing factor in the difficulties experienced by the student. Robinson and Niemer found that at-risk nursing students who participated in a peer-tutoring program improved exam scores and grade point average in the majority of their classes, and had lower attrition rates than students who did not participate in the peer-tutoring program.<sup>18</sup>

The physical therapy profession has been identified by *U.S. News & World Report* as one of the nation's top 30 best career options.<sup>19</sup> A key element of this ranking is the estimated demand for physical therapists. This estimate is based on the total number of available physical therapists, the estimated population growth, and increased population age. There is a nationwide shortage in the number of physical therapists in the United States, and these shortages are projected to continue into the future.<sup>20</sup> To meet the expanding need for physical therapists, and other allied health professionals, universities are under increasing pressure to enroll, educate, and train health care providers. Universities must maintain a delicate balance between the demand for increased enrollment and adherence to the academic standards required to produce licensed

health care professionals. Physical therapy academic programs are accredited by the Commission on Accreditation in Physical Therapy Education (CAPTE).<sup>21</sup> The criteria that CAPTE uses to directly measure the balance between enrollment and curricular success is student attrition rate and the pass rate for graduates on the National Physical Therapy Examination (NPTE).

Utzman reported that 12% of students admitted into physical therapy education programs failed to complete the curriculum within 150% of the expected time to graduate.<sup>22</sup> Poor performance in coursework is one of several potential adverse academic status events (AASE) that can result in student dismissal from a doctor of physical therapy program.<sup>12</sup> Physical therapy programs place significant emphasis on the general science GPA during the admissions process.<sup>23,24</sup> The expectation is that students who performed well in general science under graduate curriculum will also perform well in the foundational science curriculum (Human Anatomy, Neuroscience and Kinesiology) once enrolled in the DPT curriculum. Other AASE that can lead to student attrition are financial difficulty, illness, and change in career plan. Dismissal from a doctor of physical therapy program can raise the program's attrition rate, and increase expenditures and debt (especially relative to income) for students who are unable to complete the program.<sup>14</sup> According to American Student Assistance, students working towards any doctoral degree accumulate an average total of 57,860 dollars of debt.<sup>25</sup> Students who fail to complete a doctor physical therapy program face the loss of their financial investment and retention of their debt without the potential off-setting benefit of employment as a health care professional. Such detrimental effects of student attrition have led to more emphasis on improving student performance and decreasing student attrition.<sup>10,18,26,27</sup>

With the increasing demand for physical therapists, determining strategies for improving student retention is critical. Unfortunately the evidence for specific strategies is lacking, particularly when considering physical therapy student performance among underrepresented populations. To date we were unable to identify any studies that addressed student retention for physical therapy students from underrepresented populations. Historically Black colleges and universities (HBCUs) have played a critical role in educating African Americans for more than 150 years.<sup>28</sup> Currently, there are eight DPT education programs housed within HBCUs. The Hampton University DPT Program is one of these programs; the mission statement for the program includes the following: "The mission of the Department of Physical Therapy is to provide a quality physical therapy education in a multicultural environment with particular emphasis on the needs of the disadvantaged and underserved."<sup>29</sup><sup>[webpage]</sup> The Hampton University DPT program admitted 5.8% (13 out of total 224 accepted to all DPT programs in the United States) of the African American students accepted into physical therapy programs through the physical therapy centralized application service (PTCAS) during the 2013–2014 academic year. The diversity of enrollment in the Hampton University DPT Program helps establish an infrequently seen perspective on DPT student training, especially useful for building constructive responses to calls for increased representation of providers from underserved populations to correct the existing shortage of providers for these populations.<sup>5,6</sup> The purpose of this study was to determine if implementation of a retention program consisting of early identification of students who are at risk for

AASE, supplemental instruction in Human Anatomy, and a peer tutoring program for the foundational science curriculum (Human Anatomy, Neuroscience and Kinesiology) would decrease the number AASE, decrease the number of academic dismissals, and improve student academic performance in the foundational science curriculum in a culturally diverse DPT program at an HBCU.

## Methods

**Research design.** A prospective observational cohort design was used to determine the effects of the implementation of a retention program on DPT student academic performance, the occurrence of AASE, and academic dismissal.

**Subjects.** Approval for this research project was granted by the Hampton University Institutional Review Board. Students enrolled in the Hampton University DPT program that entered year one of the curriculum during the fall semester cohorts of the years 2012 and 2013 were included in this study. See Table 1 for subject demographic characteristics and pre admission graduate record examination (GRE) and grade point average (GPA) data.

The Hampton University DPT program implemented three specific approaches to

**Table 1.**

### SUBJECT DEMOGRAPHIC AND QUANTITATIVE ADMISSIONS DATA

		Cohort Admitted		
		2012	2013	p
Students enrolled		24	23	
Gender, (%)	Male	8 (33.3)	10 (43.5)	.47 <sup>a</sup>
	Female	16 (66.7)	13 (56.5)	
Ethnicity, (%)	White	6 (25.0)	10 (43.5)	.27 <sup>a</sup>
	African American	17 (70.80)	11 (47.8)	
	Asian	1 (4.2)	2 (8.7)	
	Latino	0	0	
Mean age at admission (SD)		24.8 (2.59)	25.0 (4.69)	.79 <sup>b</sup>
Mean Total TGRE		300.9 (5.55)	304.0 (7.57)	.11 <sup>b</sup>
Mean VGRE (SD)		150.9 (4.27)	152.5 (4.48)	.23 <sup>b</sup>
Mean QGRE (SD)		150.0 (3.54)	151.6 (5.56)	.25 <sup>b</sup>
Mean TGPA (SD)		3.13 (0.15)	3.21 (0.23)	.14 <sup>b</sup>
Mean PGPA (SD)		3.08 (0.20)	3.04 (0.30)	.60 <sup>b</sup>

*Notes:*

<sup>a</sup>Chi-Square test for independence for gender and ethnicity;  $p < .05$  is significant.

<sup>b</sup>Independent sample t-test to determine differences between 2012 and 2013 cohorts for graduate record examination total (TGRE), verbal (VGRE), quantitative (QGRE), total cumulative grade point average (TGPA), and program prerequisite grade point average (PGPA);  $p < .05$  is significant.

improve student retention beginning in the Fall Semester of 2013 (the first semester of the first year of the curriculum). The choice of the first semester of year one was based on historical data that identified this semester as the semester with the highest frequency of students receiving a grade below a B in a class (AASE). A total of 93 students were enrolled in the program between 2009 and 2012. Fifty nine occurrences of students receiving a grade below a B in a course happened during this time period. The frequency of students receiving a grade below a B during year one (40 occurrences) was significantly greater than years two (10 occurrences) and three (9 occurrences) Chi-square = 28.8;  $p = .000$ . Results are summarized in Table 2. Further analysis of students receiving grades below a B in a class (AASE) during year one revealed that a significantly greater frequency (21 occurrences) occurred during the fall (Chi-Square = 10.6;  $p = .005$ ) compared with the spring (8 occurrences) and summer (11 occurrences) semesters. Results are summarized in Table 3. There were no significant differences in the frequency of students receiving a grade below a B (AASE) for the three foundational science classes taken in the fall semester (Human Anatomy 13 occurrences, Neuroscience 13 occurrences, and Kinesiology 8 occurrences). See Table 4 for a summary of the results.

**The retention program** was centered on three approaches that have been reported in the literature: 1. early identification of students at risk of AAES;<sup>12,13</sup> 2. supplemental instruction through the use of second year DPT students as lab assistants in Human Anatomy;<sup>14,15</sup> 3. offering the availability of peer tutoring, by DPT year-two and year-three students, for the foundational science courses (Human Anatomy, Neuroscience, and Kinesiology).<sup>17,18</sup>

1. *Early intervention.* The Hampton University DPT program implemented a remediation process for all students with below a B (84%) average at the midterm of each semester. The Hampton University Graduate College policy is that no more than eight credit hours of grades below B may be counted toward degree requirements. Once students have accumulated greater than eight credits below B student dismissal is con-

**Table 2.**

**CONTINGENCY TABLE FOR YEARLY FREQUENCIES FOR OCCURRENCES OF STUDENTS RECEIVING GRADES BELOW A B BETWEEN 2009 AND 2012**

Curriculum Year	Grade Below a B	
	Occurred	Did Not Occur
Year 1 <sup>a</sup>	40	77
Year 2	10	107
Year 3	9	69

*Note:*  
<sup>a</sup>Chi-Square 28.8,  $p = .000$ ; Significant association at alpha 0.05

**Table 3.**

**CONTINGENCY TABLE FOR SEMESTER FREQUENCIES FOR OCCURRENCES OF STUDENTS RECEIVING A GRADE BELOW A B DURING YEAR 1 BETWEEN 2009 AND 2012**

Year 1 Semester <sup>a</sup>	Grade Below a B	
	Occurred	Did Not Occur
Fall <sup>b</sup>	21	18
Spring	8	31
Summer	11	28

Notes:

<sup>a</sup>Year 1 semester Chi-Square analysis performed based on significant association for curriculum year and grades below a B for year 1 (see table 2).

<sup>b</sup>Chi-Square 10.6,  $p = 0.005$ ; Significant association at alpha 0.05

**Table 4.**

**CONTINGENCY TABLE FOR COURSE OCCURRENCE FREQUENCIES FOR THE 21 STUDENTS RECEIVING A GRADE BELOW A B DURING THE FALL SEMESTER BETWEEN 2009 AND 2012<sup>a</sup>**

Year 1 Fall Classes	Grade Below a B Occurred	Grade Below a B Did Not Occur
Human Anatomy	13	8
Neuroscience	13	8
Kinesiology	8	13

Note:

<sup>a</sup>Chi-Square 3.20,  $p = .202$

sidered. During the period between 2009 and 2012, 10 students were dismissed from the program as a result of receiving more than eight credits below a B. When needed, the department chair initiates the remediation process by notifying each student who is designated as being at risk due to a midterm grade below B. Students are required to develop an action plan to improve academic performance based on recommendations from the course instructor. The student is required to meet with their faculty advisor and the course instructor responsible for the class in which the student earned a midterm grade below B. Documentation of these meetings is returned to the department chair and maintained as a part of the student's academic record. Faculty advising, to students

in remediation, is based on self-regulation theory and includes pre-lecture preparation, test taking skills, study habits, time management skills, and self-assessment.<sup>30</sup>

2. *Supplemental instruction.* The Hampton University DPT program identified the Human Anatomy class taken in the fall semester of year one as the best choice for supplemental instruction. Human anatomy is a foundational element of all aspects of the DPT curriculum. Mattingly and Barnes wrote, "A strong base of functional anatomy is thought to serve as the foundation for all subsequent physical therapy courses and is a cornerstone for physical therapy practice."<sup>31</sup>[p.720] In the Hampton University DPT curriculum, Human Anatomy is a six-credit course with a potentially significant impact on possible student dismissal rates: it potentially represents six of the eight credit limit for credits below the B threshold (see Graduate College criteria dismissal criteria above). The supplemental instruction program for the Hampton University DPT program consisted of student lab assistants who met a minimum academic achievement of a 3.0 grade point average for year-one course work, achieved at least a B in all courses, and for whom the faculty reached a consensus on their appropriateness as Human Anatomy lab instructors. Their responsibilities included assisting students with dissection outside of scheduled class time, supervising study sessions, and being available outside of class time for questions related to the Human Anatomy course material. Students participated with supplemental instruction for Human Anatomy on a voluntary basis; however, all students received the benefit of supplemental instructor cadaver dissection.

3. *Peer tutoring.* The purpose of the Hampton University DPT program's peer tutoring program was to provide first-year DPT students with academic assistance in the foundational science curriculum (Human Anatomy, Neuroscience, and Kinesiology) during the first semester. Peer tutors were student volunteers in the second or third year of the Hampton University DPT Program who had earned a grade of B or better for all of the foundational science classes. All tutoring services were provided cost-free by volunteer student tutors; tutors were allowed to discontinue their role as tutor at anytime. The tutoring sessions were structured around previously published findings from focus group interview sessions of DPT students in which their perceptions about peer tutoring were assessed.<sup>32</sup> The authors of this study found that DPT students preferred the following: the option to participate in either individual or group tutoring sessions, structured tutoring sessions centered around specific course content, peer tutors with exceptional communication skills and mastery of course content, tutoring services provided at a time convenient to the students, and individual learning styles being a consideration when tutoring services are planned.<sup>32</sup> The peer tutoring program is summarized in Appendices 1 and 2 (available from the authors upon request).

**Statistical analysis.** Our classification of AASE was based on the definition published by Utzman et al. who coded academic difficulty into six categories; 0. Progressed through the program with no interruptions. 1. Academic problems including repeat courses, academic probation, and others. 2. Non-academic delay in progression through program includes occurrences such as illness or financial difficulty. 3. Academic dismissal occurring as a result of failure to meet academic or clinical performance standards. 4. Academic withdrawal occurring when student voluntarily withdrew from the program when in jeopardy of being dismissed due to poor academic status. 5. Nonacademic withdrawal occurring when student voluntarily withdrew for a reason other than aca-



ademic status (e.g., illness, financial difficulty).<sup>22</sup> Our analysis utilized the definition of AASE that included students who earned a grade below B in one of the foundational science classes (Human Anatomy, Neuroscience, and Kinesiology). Each class in which a student earned a grade of less than a B was classified as an occurrence of an AASE. We used a chi-square test of independence to determine if a significant difference existed between the frequency of occurrences of a grade below a B (AASE) in one of the foundational sciences (Human Anatomy, Neuroscience, and Kinesiology) and the introduction of the retention program in the Fall Semester of 2013 compared with the Fall Semester of 2012 (no retention program). A chi-square test of independence was also used to determine if a significant difference existed between the implementation of the retention and program and a decrease in the number of students dismissed from the program for poor academic performance between the cohorts of Fall Semester 2012 (no retention program) and Fall Semester 2013 (retention program implemented).

The other outcome of interest was whether or not the implementation of the retention program increased overall cohort performance in the foundational science classes (Human Anatomy, Neuroscience, and Kinesiology) during the initial Fall Semester. We used Mann-Whitney U analysis to determine if performance differences, based on grades earned (ordinal scale), existed between all students enrolled in the Fall Semester of 2012 (no retention program) and all students enrolled in the Fall Semester of 2013 (retention program implemented).

## Results

Complete demographic data for the 2012 and 2013 cohorts are presented in Table 1. No significant differences existed between the two cohorts in terms of ethnic make-up or gender percentages. There were no significant differences in quantitative admissions criteria (GPA or Graduate Record Exam [GRE] scores) for the two cohorts assessed in our study.

Fifteen out of 23 students (65.2%) received notification of their at-risk status for an AASE at midterm during the Fall Semester of 2013, following implementation of the early intervention component of the retention program. Notifications were based on students receiving a grade below a B at the midterm of the Fall Semester. Five of the 15 at-risk students (33.3%) participated in the peer tutoring component of the retention program. These voluntary tutoring sessions ranged from 10 to 75 minutes (mean = 48 minutes). Four were in person and one was via video conference. Two of the tutoring sessions were based on both Anatomy and Neuroscience course material. The remaining three sessions consisted of two sessions for Human Anatomy course material only, and one for Neuroscience course material only. No students participated in peer tutoring for Kinesiology during the Fall Semester of 2013.

A total of 24 students entered the program in the Fall Semester of 2012 (no retention program). Six students (25.0%) in this cohort earned a total of 10 grades below a B (AASE). Four students (16.7%) were dismissed from the program as a result of more than eight credits below a B. There were a total of 23 students in the cohort entering the program in the Fall Semester of 2013 (retention program implemented).

Three students (13.0%) in the 2013 cohort earned a total of four grades below a B (AASE). No students in this cohort were dismissed from the program. All AASE's that occurred with both cohorts (2012 and 2013) during the fall semester of year one were a result of grades below a B in one of the foundational science classes (Human Anatomy, Neuroscience, and Kinesiology). No significant difference existed between the implementation of the retention program and students receiving a grade below a B (AASE) during the fall semester (chi-square = 1.08;  $p = .30$ ), results are summarized in Table 5. A significant difference existed between the implementation of the retention program and the reduction of dismissals from the Fall Semester of 2012 (4 students) to the Fall Semester of 2013 (0 students) semesters (chi-square = 4.19;  $p = .04$ ); results are summarized in Table 6.

The demographic characteristics of the six students who earned a grade below a B during the Fall Semester of 2012 included the following: three male, three female; five

**Table 5.**

**CONTINGENCY TABLE FOR FREQUENCIES OF STUDENTS WHO RECEIVED A GRADE BELOW A B DURING FALL 2012 (NO RETENTION PROGRAM) AND FALL 2013 (RETENTION PROGRAM IMPLEMENTED)<sup>a</sup>**

Foundational Science Courses	Grade Below a B Occurred	Grade Below a B Did Not Occur
Fall 2012	6	18
Fall 2013	3	20

*Note:*

<sup>a</sup>Chi-Square 1.08,  $p = .30$

**Table 6.**

**CONTINGENCY TABLE FOR FREQUENCIES OF DISMISSAL DURING FALL 2012 (NO RETENTION PROGRAM) AND FALL 2013 (RETENTION PROGRAM IMPLEMENTED)**

Year 1 Semester	Program Dismissal	
	Dismissal Occurred	Dismissal Did Not Occur
Fall 2012	4	20
Fall 2013 <sup>a</sup>	0	23

*Note:*

<sup>a</sup>Chi-Square 4.19,  $p = .04$ ; Significant association at alpha 0.05

African American, one Asian. All four students dismissed were African American. The demographic characteristics of the three students who earned a grade below a B during the Fall Semester of 2013 included the following: two male, one female; two African American, one White. No significant difference existed between earning a grade below a B and gender or race/ethnicity. A summary of the demographic characteristics of students who earned below a B during the Fall Semester of 2012 and 2013 is presented in Table 7.

The frequency of the occurrences of grades below a B (AASE) during 2012 and 2013 for each foundational science class are presented in Table 8. A total of 6 (25%) students earned a grade below a B (AASE) during the Fall Semester of 2012 in Human Anatomy class, while no students earned a grade below a B during the Fall Semester of 2013.

**Table 7.**

**DEMOGRAPHICS OF STUDENTS RECEIVING GRADES BELOW A B DURING FALL 2012 AND 2013**

		Cohort Admitted		Total	p
		2012	2013		
Students enrolled		24	23	47	
Gender, (%)	Male	3 (12.5)	1 (4.3)	4 (8.5)	.27 <sup>a</sup>
	Female	3 (12.5)	1 (4.3)	4 (8.5)	
Ethnicity, (%)	White	0	1 (4.3)	1 (2.1)	.26 <sup>a</sup>
	African American	5 (20.8)	2 (8.7)	7 (14.9)	
	Asian	1 (4.2)	0	1 (2.1)	
	Latino	0	0	0	

Note:

<sup>a</sup>Chi-Square test for goodness of fit for gender and ethnicity;  $p < .05$  is significant.

**Table 8.**

**FREQUENCIES OF TOTAL GRADES BELOW A B DURING FALL 2012 (NO RETENTION PROGRAM) AND FALL 2013 (RETENTION PROGRAM IMPLEMENTED) FOR FOUNDATIONAL SCIENCE CURRICULUM**

Foundational Science Course	Number of Grades Below B Fall 2012	Number of Grades Below B Fall 2013
Human Anatomy	6 (25.0%)	0 (0.0%)
Neuroscience	2 (8.3%)	2 (8.7%)
Kinesiology	2 (8.3%)	2 (8.7%)

**Table 9.**

**CONTINGENCY TABLE FOR FREQUENCIES OF TOTAL OCCURRENCES OF GRADES BELOW A B IN HUMAN ANATOMY FALL 2012 (NO RETENTION PROGRAM) AND FALL 2013 (RETENTION PROGRAM IMPLEMENTED)**

<b>Foundational Course</b>	<b>Grade Below a B Occurred</b>	<b>Grade Below a B Did Not Occur</b>
Anatomy Fall 2012	6	18
Anatomy Fall 2013 <sup>a</sup>	0	23

*Note:*

<sup>a</sup>Chi-Square 6.59,  $p = .01$ ; Significant at alpha 0.05.

**Table 10.**

**MANN-WHITNEY U TEST RESULTS FOR COMPARISON BETWEEN FALL BASIC SCIENCE COURSES FOR FALL 2012 (NO RETENTION PROGRAM) AND FALL 2013 (RETENTION PROGRAM IMPLEMENTED)**

<b>Course</b>	<b>Mean Rank Grades Fall 2012 (n=24)</b>	<b>Mean Rank Grades Fall 2013 (n=23)</b>	<b>Mann-Whitney U</b>	<b>p value</b>
Human Anatomy	22.8	25.3	246.5	.52
Neuroscience	25.0	23.0	252.0	.59
Kinesiology	26.0	21.9	228.0	.30

*Note:*

<sup>a</sup>Grade Scale: A+ = 4.1; A = 4; A- = 3.7; B+ = 3.3; B = 3; B- = 2.7; C+ = 2.3; C = 2.0; C- = 1.7; D+ = 1.3; D = 1; D- = .7

There was a significant reduction in grades below a B in Human Anatomy between the 2012 cohort (six occurrences) and 2013 cohort (0 occurrences) (chi-square = 6.59;  $p = .01$ ); all grades below a B during the 2013 cohort with the retention program occurred in either Neuroscience (two occurrences) or Kinesiology (two occurrences). Results are summarized in Table 9.

No significant difference in overall cohort performance between the 2012 (no retention program) and 2013 (retention program implemented) were identified for any of the three foundational science classes (Human Anatomy, Mann-Whitney U = 246.5,  $p = .52$ ; Neuroscience, Mann-Whitney U = 252.0,  $p = .59$ ; and Kinesiology, Mann-Whitney U = 228.0,  $p = .30$ ); results are summarized in Table 10. The mean (standard deviation)

grade for the 2012 cohort in each of the foundational science classes were as follows: Human Anatomy = 3.27 (0.59); Neuroscience = 3.30 (0.43); Kinesiology = 3.46 (0.43). The mean (standard deviation) grade for the 2013 cohort in each of the foundational science classes were as follows: Human Anatomy = 3.40 (0.41); Neuroscience = 3.23 (0.41); Kinesiology = 3.34 (0.42).

## Discussion

We introduced a systematic retention program during the Fall Semester of the first year of the Hampton University DPT program with the goal of improving student performance and reducing the number AASE among our students. This program included three primary components; early intervention through identifying students at risk for AASE, supplemental instruction in the Human Anatomy course, and peer tutoring services provided by year-two and year-three DPT students. Following implementation of this program in the Fall Semester of 2013, the overall percentage of students receiving a grade below a B (AASE) in one of the foundational science courses decreased to 13.0% (three out of 23) compared with 25.0% (six out of 24) in 2012 (no retention program). This decrease, though not significant, achieved the program goal of decreasing the total number of students experiencing AASE. The absolute risk reduction (control group event rate – experimental group event rate) for students receiving below a B in foundational science courses was 12%. Implementation of the retention program for the 2013 DPT cohort reduced the risk (relative risk reduction = control group event rate – experimental group event rate/control group event rate) of students earning a grade below a B by 48%. Along with this reduced overall percentage in students earning a grade below a B (AASE), no student earned below a B in the Human Anatomy course during the Fall Semester of 2013. This is a critical improvement considering that Human Anatomy is a six-credit course, and all students dismissed from the 2012 cohort earned a grade below a B in Human Anatomy. The two retention program factors that we believe accounted for this improvement were early identification of at-risk students and supplemental instruction in Human Anatomy.

We identified at-risk students as individuals with midterm grades below B in any course during the fall 2013 semester. These students were given written notification of their status, and were required to create an action plan to improve academic performance in the specific course that academic difficulty was occurring. A key component of this process was that students were required to individually identify specific areas of weakness through self reflection. Sandars and Cleary identified self-reflection as being a critical element in improving academic performance.<sup>30</sup> Activities, such as our required action plan, that support and facilitate student autonomy have been reported to be an effective means of improving academic performance and enhancing motivation to learn in health care students.<sup>33</sup>

Supplemental instruction is one of the most common means that health care educational institutions employ to improve student performance.<sup>14</sup> Our choice of Human Anatomy for supplemental instruction was based on the critical nature of anatomy in the DPT clinical curriculum and the potential negative impact of earning a grade below a B (AASE) in a six-credit course. Supplemental instruction for Human Anatomy has

previously been reported as a successful means of improving student performance.<sup>15</sup> These authors based the implementation of supplemental instruction on the identification of courses that posed increased risk for student AAES. In a similar study evaluating the effectiveness of supplemental instruction in an undergraduate Human Anatomy course, Bruno et al. reported improved performance that was closely related to the frequency of student attendance for supplemental instruction.<sup>34</sup> We feel that our introduction of supplemental instruction as a component of the retention program contributed to the improvement in overall performance for Human Anatomy. This was consistent with the findings reported by Bruno et al.<sup>34</sup> Implementation of our retention program was a critical contributing factor to the reduction in the number of students dismissed from the program due to poor academic performance from four in 2012 (no retention program) to zero in 2013 (retention program implemented). All four students who were dismissed at the end of the 2012 semester were dismissed as a result of accumulating more than eight credits below B, and each of these students earned a grade below B in Human Anatomy (six credits). We concluded that the impact that the retention program had on performance in Human Anatomy accounted for the lower total number of dismissals from the program, despite the lack of an overall difference in the total number of AASE occurrences.

There was no significant difference in cohort grade performance in the foundational science courses (Human Anatomy, Neuroscience, and Kinesiology) between the fall semester 2012 (no retention program) and 2013 (retention program implemented). Fifteen out of 23 students (65.2%) were required to participate in the retention program due to poor academic performance (grade below B) through the semester midterm. Of these 15 students only three (20%) earned a final grade below a B. Twelve students (80%), who were in jeopardy of an AASE at the midterm, improved their academic performance to an acceptable level following participation in the retention program. Human Anatomy was the only course out of the three foundational sciences in which cohort grade performance improved (2012 GPA = 3.28; 2013 GPA = 3.40) following the introduction of the retention program during the Fall Semester of 2013.

The retention program did not include supplemental instruction for Neuroscience or Kinesiology classes. However, students did have the option of receiving individual peer tutoring sessions from year two or year three DPT students for these classes. Previously, Youdas et al. found that peer-teaching can provide an effective environment for doctor of physical therapy students seeking improved performance in gross human anatomy.<sup>17</sup> They found that 82% of the participants reported peer-teaching sessions as being useful for acquiring an effective learning strategy when studying gross anatomy outside of the formal classroom or lab sessions. The authors also found that the tutors themselves benefited from an increase in teaching, academic, organizational, and time management skills.

The peer tutoring program, like the supplemental instruction for Human Anatomy, was voluntary. We felt that peer tutoring was underused, especially considering the emphasis that the faculty placed on creating a tutoring program that included previously reported student preferences.<sup>32</sup> Only five students out of 23 (21.7%) in the 2013 cohort participated in the peer tutoring program. This is fewer than expected considering 15 out of 23 students (65.2%) received notification of risk for AASE at the midterm.

Increased participation in the peer tutoring program has the potential for greater impact on performance in the foundational science courses, particularly if students at risk for AASE increased use of peer tutoring.

This study presents retention strategies with particular consideration for the unique characteristics of students enrolled in HBCU DPT programs. The percentage of African American students enrolled in the Hampton University DPT program from 2009 to 2013 was 53.9% compared with 4.7% accepted nationally through the PTCAS system. The diversity of the Hampton Universities' DPT enrollment, compared with national enrollment, provides important insights into the development and implementation of programs to improve retention of students from underserved populations. Improving student retention is a critical aspect of increasing the number of health care providers from underserved populations. This is vital in light of the higher attrition rates seen among African American health care students.<sup>11</sup> All four students dismissed from the fall 2012 cohort were African American. The goal of our program was to reduce all academic dismissals; however, reducing academic dismissals among African American students is particularly important considering that improving the numbers of DPT graduates from under-represented populations is a part of the school's mission statement. The number of academic dismissals during the Fall Semester of 2013 was reduced to zero following the successful implementation of our retention program. We conclude that this warrants continuation of the program with continued investigation of the results.

**Limitations.** This study has several limitations that should be considered. The sample cohort is limited to students in one DPT program and may not be generalizable to other institutions. The findings are also limited to two cohorts of small size (24 in 2012 and 23 in 2013) when compared with the average DPT cohorts of 44 students.<sup>21</sup> The authors felt that it was important to determine what if any benefits implementation of a retention program would bring to current and future students. Continued data collection from future cohorts is a consideration in order to enhance the external validity of our findings.

**Conclusion.** We successfully implemented a retention program that included early identification of students at risk of AASE, supplemental instruction for Human Anatomy, and peer tutoring for the foundational sciences. This retention program had a beneficial effect on decreasing AASE and student dismissals during the first semester of the Hampton University DPT program during the Fall Semester of 2013.

Future considerations for the Hampton University DPT program include determining ways to increase participation in peer tutoring as well expanding supplemental instruction into Neuroscience and Kinesiology courses.

## Appendix 1

1. Peer tutoring was made available for the following classes: Human Anatomy, Neuroscience and Kinesiology.
2. Students requesting tutoring were required to submit a minimum of one question in order to be assigned to a tutor. This question was required to be related to the course in which tutoring was being sought.

3. Students requesting tutoring and each tutor completed The Index of Learning Styles Questionnaire. This allowed the tutors to be matched with students with similar learning styles.
4. Tutors participated on a voluntary basis and were expected to be prepared to provide either individual or small group (5 or less) tutoring sessions.
5. Each tutoring session centered around specific student questions (submitted prior to session) based on course material from one of the foundational science courses (Human Anatomy, Neuroscience, and Kinesiology). A physical therapist faculty member provided the tutor with a “clinical take home message” for each session. The tutor was required to provide a summary of the material reviewed during the session.
6. Peer tutors were required to be available for a maximum of two one hour sessions per week.
7. Sessions were either in person or via video conference (Skype, etc.).
8. Tutors were required to complete summary log for all tutoring sessions (see appendix 2).

## Appendix 2

### Tutor Session Summary Form

Tutor #: \_\_\_\_\_ Session Subject(s): \_\_\_\_\_

Student #: \_\_\_\_\_ Session Date: \_\_\_\_\_ Start time: \_\_\_\_\_ End time: \_\_\_\_\_

Session Type: \_\_\_\_\_

Questions:

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Clinical Bottom Line:

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Session summary:

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Student was prepared for the session (specific question, read pertinent material, etc.): y \_\_\_\_ n \_\_\_\_

Able to relate question(s) to a “clinical bottom line”: y \_\_\_\_ n \_\_\_\_



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