Effect of Student Demographics, Prior Military Service, and Class Start Times on Academic Performance in a Respiratory Care Program

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BACKGROUND: Current research regarding the effect of demographics and characteristics of respiratory therapy students on academic performance in respiratory therapy programs is lacking. Students pursuing higher education degrees have a variety of backgrounds, and understanding the factors that impact student academic performance may improve student learning and academic outcomes. The purpose of this study was to determine the effect of age, gender, prior military service, and class start time on student academic performance in respiratory care. METHODS: A retrospective comparative study was performed with 33 students from 8 cohorts enrolled in the Respiratory Therapy Program at Concorde Career College - San Antonio between 2016–2020. The students' academic performance was assessed in the Introduction to and Application of Respiratory Therapeutics (RT 210) course; the final respiratory care course, Advanced Clinical Practice (RT 250); the secure National Board of Respiratory Care Self-Assessment Examination (NBRC SAE); and the NBRC Therapist Multiple-Choice (NBRC TMC) Examination. Independent *t* tests and Pearson correlations were used for data analysis. A significance level of 0.05 was considered statistically significant. RESULTS: There was no statistically significant difference between male and female students in RT 210 ($P = .23$), RT 250 ($P = .60$), the secure NBRC SAE ($P = .23$), and percentage of students passing the NBRC TMC ($P = .96$). No significant difference was found between AM and PM classes on students' academic performance in RT 210 ($P = .76$), RT 250 ($P = .51$), the secure NBRC SAE ($P = .23$), and percentage of students passing the NBRC TMC ($P = .38$). The results of this study showed no significant difference in the veteran and non-veteran student groups in RT 210 ($P = .07$), RT 250 ($P = .69$), and the secure NBRC SAE ($P = .15$). A strong positive correlation was discovered between academic performance in RT 210 and RT 250 courses ($r = 0.725$, $P < .001$) and between RT 210, the secure NBRC SAE ($r = 0.744$, $P < .001$), and between RT 250 and the secure NBRC SAE ($r = 0.789$, $P < .001$). The percentage of students passing the NBRC TMC was not significantly different between groups of gender ($P = .64$), class start times ($P = .38$), and prior military services ($P = .96$). CONCLUSIONS: Age, gender, class start times, and prior military service had no statistically significant effect on academic performance in this study. There is a positive correlation between students' performance in RT 210 and RT 250 and students' grades in these courses and the secure NBRC SAE. *Key words: academic performance; NBRC; respiratory care education; demographics; students; veteran; class start time.* [Respir Care 2021;66(11):1752–1757. © 2021 Daedalus Enterprises]

Introduction

Respiratory care education programs play a crucial role in the development and advancement of the respiratory care profession. Respiratory care students can choose from numerous degree types offered throughout the United States. As of August 15, 2020, there are currently 341 entry-level associate degree respiratory therapy programs and 70 entry-level baccalaureate degree respiratory programs that are accredited by the Commission on Accreditation for Respiratory Care. Some of these respiratory therapy programs in the United States include an 18-month associate-level program with a condensed 10-weeks term.

The condensed schedule requires the student to learn and retain information in a 10-weeks term rather than the more traditional 15-weeks semester typically offered in the traditional associate and baccalaureate respiratory therapy programs. The term schedule is continuous, with a new term

beginning at the conclusion of the previous term. The Respiratory Therapy Program at the study site is made of seven 10-weeks terms in total; the first 2 terms are prerequisite general studies courses followed by five 10-weeks respiratory therapy courses. If a prospective student chooses to attend the applied associate degree in the Respiratory Therapy Program participating in this study, they could face numerous challenges such as the program's increased pace, 12-h clinical days, and 5-h-long class periods. All students who attend the Respiratory Therapy Program at Concorde Career College - San Antonio participate in the condensed course schedule. Students who are enrolled in the Introduction to and Applied Respiratory Therapeutics (RT 210) course attend class 5 days a week for 5-h class periods starting at either 8:00 AM or 1:00 PM to receive 14 credit hours for the 10-weeks term. Students enrolled in the Advanced Clinical Practice (RT 250) course complete 90 clinical hours and 28 lectures that are 5-h long to receive 10 credit hours. The class start time remained unchanged from the time of enrollment into the program.

Prior to enrolling into the program, the students complete an interview with the program director and are provided a program calendar with the beginning and end of term dates. The outline of all the courses is also presented to the student with the clinical and classroom h to be completed each term. To be admitted into the program, the prospective students will complete the Health Education Systems Inc (HESI) A2 entrance examination (HESI A2, Elsevier, Amsterdam, the Netherlands). The HESI A2 has 3 sections: (1) mathematics, (2) reading, and (3) vocabulary. The student must achieve a 70% average overall score between all sections to be admitted into the Respiratory Therapy Program. Each cohort may contain up to 12 students; if there are more prospective students then available seats, priority will be given to the highest student scores on the HESI A2 and second at the program director's discretion. All students participate in the condensed-term schedule regardless of when in the calendar year they are enrolled.

Even though there are more associate degree programs in the United States, research into the academic success of respiratory care students has primarily focused on students in the baccalaureate-level respiratory care programs. Topics include predictors for academic success, grading variables, characteristics of a successful program, clinical education, student retention, and the impact of gender on student success.[1-9] The limited research on associate-level respiratory care programs has focused on comparing associate and baccalaureate programs in terms of diversity or faculty attitudes.[10,11,12]

Currently, no research is available on the effect of student demographics and characteristics on academic success in an 18-month associate-level program that utilizes condensed 10-weeks terms. The main incentive for working on this project was to explore factors that affect the academic performance of students enrolled in an associate degree program using a condensed schedule to establish a solid basis for further improvement in respiratory care education. The program used in this study requires the students to participate in 25–41 scheduled hours of in-person classroom learning or clinical learning each week. The students often spend additional time completing homework and independent studies outside of the classroom and clinical hours. It is also important to note that the respiratory-specific coursework and clinical requirements of the accelerated respiratory care program may exceed the requirements of some respiratory care programs in the nation.

Given the absence of research that investigates accelerated associate degree respiratory programs, not enough is known about the influence of student characteristics and class start time on student success on the respiratory care

QUICK LOOK

Current knowledge

Research into the academic success of respiratory therapy students has primarily focused on baccalaureate programs despite there being more associate level programs available. Factors such as student retention, grading variables, characteristics of a successful program, clinical education, student retention and the impact of gender have all been studied at the baccalaureate level. There is limited research on associate level programs and no research on predictors of academic success in an 18-month associate level program utilizing an accelerated schedule.

What this paper contributes to our knowledge

In an 18-month associate level program that utilizes an accelerated schedule, age, gender, prior military service, and class start times did not affect academic performance in this study. There was a positive correlation between the students' performance in the first and last respiratory therapy courses in the program as well as the NBRC SAE.

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Ms Blain has no conflicts of interest to disclose. Dr Ari discloses relationships with Phillips Healthcare, Boehringer Ingelheim, Aerogen, and Elsevier.

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Table 1. Means ± SD Students' Academic Performance Based on Gender

Variables	Female ($n = 17$, 51.5%)	Male ($n = 16$, 48.5%)	P
RT 210 grade	83 ± 6	86 ± 7	.23
RT 250 grade	81 ± 4	82 ± 6	.60
NBRC SAE	68 ± 5	71 ± 9	.23
% of students passing NBRC TMC	88%	94%	.96

education programs. Therefore, the purpose of this study was to determine the effect of age, gender, class start time, and prior military service on students' academic performance in an 18-month associate-level program with a condensed course schedule. The relationship between academic performance in the RT 210 and RT 250 courses and the secure National Board for Respiratory Care Self-Assessment Examination (NBRC SAE) (National Board for Respiratory Care, Overland Park, Kansas) was also explored.

Methods

This retrospective study used existing student records from the Department of Respiratory Therapy at Concorde Career College - San Antonio. Student records and demographics were collected from 37 students enrolled from 2016–2020. A database of study variables including age, gender (male/female), prior military status (veteran/non-veteran), class start time (AM/PM), and student scores on RT 210, RT 250, and the secure NBRC SAE was created from the student records. The secure NBRC SAE taken by the students for this study is only available to respiratory therapy program directors. This study did not include the publicly available NBRC multiple-choice examinations. Exclusion criteria included incomplete student records and subsequent attempts at courses or examinations. For students who repeated any course or examination, the first attempt was recorded, and the second attempt was excluded from the study. Students who did not complete both RT 210 and RT 250 were excluded from the study. During the years of 2016–2020, the programs attrition rate was 12% during the respiratory therapy courses of the curriculum; these students were withdrawn and did not reenter the Respiratory Therapy Program.

After exclusion criteria were applied, a total 33 students were included in the study. The final sample population included 17 (51.5%) females, 16 (48.5%) males, 12 (36.4%) veterans, and 21 (63.6%) non-veterans. The AM class start time had 17 (51.5%) students, and the PM start time had 16 (48.5%) students. The average age of all students was 30.6 y.

This study has been reviewed and approved by the Texas State University Institutional Review Board. The data were collected and stored following the guidelines established in the Family Educational Rights and Privacy Act to protect the anonymity of the students included in the study.

The study variables include the student's age in y at the time of enrollment, gender, veteran status, and the class start time. The class start time was selected by the college's admissions office at the time of enrollment and did not change throughout the program. The outcome variables were the student's grades in RT 210, RT 250, and the secure NBRC SAE. The percentage of students who passed the NBRC Therapist Multiple-Choice (NBRC TMC) Examination (National Board for Respiratory Care) was also determined and analyzed. The final numerical course grade from RT 210 and RT 250 was used as the measure for the student's academic performance. The students' secure NBRC SAE score was recorded as a percentage of the total number of correct responses the student achieved on the examination out of the total questions.

Descriptive statistics were performed on all groups to analyze the students' demographics and overall performance on all examinations and courses. To explore the effect of gender, prior military service, and class start time on students' academic performance, the following 3 sets of comparisons were made using the independent t test: (1) female versus male, (2) veteran versus non-veteran, and (3) AM class time versus PM class time. A Pearson product-moment correlation was performed to determine the relationship between age and academic performance. The statistical analysis was completed using IBM SPSS Statistics version 25 (IBM, Armonk, New York), and $P < .05$ was considered statistically significant.

Results

Table 1 shows the means and SD of students' academic performance based on gender. The gender groups were similar in sample size with 17 students in the female group and 16 students in the male group. There was no statistically significant difference between male and female students in RT 210 ($P = .23$), RT 250 ($P = .60$), and the NBRC SAE ($P = .23$) and percentage of students passing the NBRC TMC ($P = .96$).

The AM class and PM class were similar in age (31.88 ± 9.49 and 29.25 ± 10.10, respectively) and gender

Table 2. Comparisons of AM and PM Class Start Time on Students' Academic Performance

Variables	AM Class ($n = 17$, 51.5%)	PM Class ($n = 16$, 48.5%)	P
RT 210 grade	84 ± 8	85 ± 5	.76
RT 250 grade	80 ± 5	82 ± 5	.51
NBRC SAE	68 ± 8	71 ± 5	.23
% of students passing NBRC TMC	94%	88%	.38

Table 3. Impact of Prior Military Service on Students' Academic Performance

Variables	Veteran ($n = 12$, 42.85%)	Non-Veteran ($n = 16$, 57.15%)	P
RT 210 grade	88 ± 5	85 ± 5	.07
RT 250 grade	82 ± 5	82 ± 4	.69
NBRC SAE	73 ± 5	70 ± 6	.15
% of students passing NBRC TMC	92%	90%	.64

Table 4. Pearson Product-Moment Correlation Coefficients Between Age and Academic Performance in RT 210, RT 250, and the NBRC SAE

Variables		Age	RT 210 Grade	RT 250 Grade
RT 210 grade	r	0.15		
	P	.41		
RT 250 grade	r	−0.03	0.73	
	P	.86	< .001	
NBRC SAE	r	−0.05	0.74	0.79
	P	.81	< .001	< .001

distribution (AM class: 52.94% female, 47.06% male; PM class: 50% female, 50% male, respectively). As shown in Table 2, no significant difference was found between AM and PM classes on students' academic performance in RT 210 ($P = .76$), RT 250 ($P = .51$), and the NBRC SAE ($P = .23$) and percentage of students passing the NBRC TMC ($P = .38$).

As shown in Table 3, there was no significant difference in the veteran and non-veteran student groups in RT 210 ($P = .07$), RT 250 ($P = .69$), and the secure NBRC SAE ($P = .15$).

Table 4 presents the correlation coefficients and corresponding significance levels. There is no significant correlation between age and students' academic performance in RT 210 ($P = .43$), RT 250 ($P = .86$), and the NBRC SAE ($P = .79$). The study results reveal a positive correlation between the RT 210 and RT 250 course grades ($r = 0.725$, $P < .001$) and between the NBRC SAE and the students' grades in RT 210 ($r = 0.744$, $P < .001$) and RT 250 ($r = 0.789$, $P < .001$). For example, the correlation between the RT 210 grade and RT 250 grade was 0.725 ($P < .001$), indicating that students' grade in RT 210 ($r = 0.725$, $P < .001$) was responsible for 52% of the variation in the RT 250 grade. Similarly, the grade obtained in RT 210 ($r = 0.744$, $P < .001$) accounts for 55% of the variation in the NBRC SAE score. The study findings also revealed that 62% variation in students' NBRC SAE scores can be explained by their grade in RT 250 ($r = 0.789$, $P < .001$).

Discussion

The primary goal of respiratory therapy education programs is to educate and train students and provide them the tools they need to become skilled clinicians. Through understanding student individual characteristics that may influence success in a respiratory education program, educators can create a well-balanced program that optimizes student learning. This is the first study that evaluated the impact of student's age, gender, and veteran status on student's academic success at an associate-level program with a condensed schedule. Given the quick pace of this program and the increased difficulty the schedule creates, it is critical to understand how student demographics, such as age and gender, class start time, and other characteristics, such as prior military experience, affect academic success.

The present study found no significant difference in academic performance between female and male students in the sample population. This finding agrees with previous research by Ari et al,[13] who evaluated the impact of gender on academic success in a respiratory therapy educational program. They found no difference in male and female students when comparing the entering GPA, exit GPA, or their performance on NBRC examinations. Similar research has been performed in the dental and maxillofacial surgical fields; the researchers also found no difference in performance or academic outcomes when only gender was considered, agreeing with the present study.[14,15] A study of the impact of gender and other demographics on academic success was performed with business students. Alhajraf and

Alashour found undergraduate male business students significantly outperformed their female counterparts.[16] Whereas the present study found that males did tend to score higher than female students, it did not produce a significant difference in overall outcomes. Further research with a larger sample size may be necessary to reconsider if gender impacts student performance or if the field of study was responsible for the different results.

Previous research that investigated the effect of class start times on academic performance has focused primarily on high school students and found later class start times generally corresponded with improved attendance resulting in better grades.[17] This study found no significant difference in academic achievement outcomes between the AM and PM class start times because attendance within the Respiratory Care Program is mandatory for the students. Earlier class start times may lead to chronically poor sleep for students in general. A study from the Netherlands suggested better sleep quality is associated with better academic achievement. These results may prove relevant to the present study given that a later start time provides the students with an opportunity for more sleep.[18]

Many studies have been performed on how chronotypes (a person's ability to function at any given time of day) impact a student's learning approach and academic achievement.[19,20,21] Akram et al[19] researched morningness-eveningness learning preferences, learning approaches, and academic achievement of undergraduate medical students. They reported that morning learning types had a deeper understanding of materials compared to evening learning types. This agrees with Beşoluk et al research[20] on learning preferences and academic achievement of university students that suggested teaching and test times, and morning preference learners, achieved higher scores. Enright and Refinetti[21] also researched how the different chronotypes and class times affect academic achievement in university students. They assessed student chronotypes and course grades and included class start time during their analysis and confirmed morning type chronotypes performed better academically compared to evening type chronotypes. Whereas studying learning preferences, approaches, and chronotypes were beyond the scope of this study, the AM students had a 94.1% pass rate on the NBRC TMC examination and the afternoon students had a pass rate of 87.5%, suggesting the AM class may have an inherent deeper understanding of the material after completing the Respiratory Care Program, agreeing with the previous research. Further research into how chronotypes may affect learning in a respiratory care program when following a strict class start time schedule should be performed to assess this potential relationship.

Research into the academic success of students with prior military service has not been performed in respiratory care programs. According to the findings of this study, students with prior military service tend to score higher than their non-veteran counterparts in all courses and examinations, though the results did not meet the threshold for significance. The underlying cause for this difference was not researched during this study. Additional research into how veteran students perform compared to non-veteran students may be warranted. Research regarding veteran education generally focuses on student's ability and how to help in their acclimation to the higher education environment, not on veterans' academic performance.[22-25]

This study found no correlation between age and the student's academic performance when considering the outcome measurements. A literature review on the effect of mature age on student academic success in undergraduate-level nursing programs[26] discovered a lack of agreement on what age was considered mature and how academic success was measured.[26] The overall results illustrated a lack of agreement concerning whether and how mature age affected academic performance in the studied programs.[26] A systematic review of predictors for academic success in a baccalaureate nursing program discussing age and other noncognitive characteristics also found contradictory results among previous studies.[27] In some studies, age, gender, and ethnicity were significant predictors for academic success; and in other studies, they were not significant.[27] Given the small sample size of the present study, more research is warranted to discover how and whether age affects the academic performance of respiratory students.

Conclusions

Age, gender, prior military service, and class start times did not affect academic performance in this study. There was a positive correlation between students' performance in RT 210 and RT 250 and students' grades in these courses and the secure NBRC SAE.

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