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Abstract

Background and Purpose: The purpose of this study is to investigate any association between pre-enrollment curricula and clinical performance in physical therapy professional schools. Specifically, does the type of undergraduate institution (as defined by Carnegie classification type) influence performance on components of the Physical Therapist Clinical Performance Instrument? **Methods:** The study methods include a retrospective quantitative review of student educational records from the Duke Doctor of Physical Therapy (DPT) classes of 2013 to present. Kruskal-Wallis tests were used to determine significance of the dependent variables. **Results:** Results indicated that when the Carnegie Classifications were consolidated to five categories, there was only a significant difference in score for one of the 108 possible scales in the CPI (Professional Behavior, Final 3). Students who attended an undergraduate institution with a professional focus (category 5) scored significantly ($p=.033$) higher on this Professional Behavior scale than did students who attended an undergraduate institution with an arts and sciences focus (category 1). When the Carnegie Classifications were consolidated to four categories, two scales showed significant results (Professional Behavior, Final 3; Accountability, Final 3). **Conclusions:** The study fails to confirm the hypothesis that the type of undergraduate institution influences performance on components of the Physical Therapist Clinical Performance Instrument. There is virtually no difference on clinical performance based on undergraduate institution type.

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The Influence of Pre-Professional Curricula on Components of the Physical Therapist Clinical Performance Instrument

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Abstract

Background and Purpose: The purpose of this study is to investigate any association between pre-enrollment curricula and clinical performance in physical therapy professional schools. Specifically, does the type of undergraduate institution (as defined by Carnegie classification type) influence performance on components of the Physical Therapist Clinical Performance Instrument? **Methods:** The study methods include a retrospective quantitative review of student educational records from the Duke Doctor of Physical Therapy (DPT) classes of 2013 to present. Kruskal-Wallis tests were used to determine significance of the dependent variables. **Results:** Results indicated that when the Carnegie Classifications were consolidated to five categories, there was only a significant difference in score for one of the 108 possible scales in the CPI (Professional Behavior, Final 3). Students who attended an undergraduate institution with a professional focus (category 5) scored significantly ($p=.033$) higher on this Professional Behavior scale than did students who attended an undergraduate institution with an arts and sciences focus (category 1). When the Carnegie Classifications were consolidated to four categories, two scales showed significant results (Professional Behavior, Final 3; Accountability, Final 3). **Conclusions:** The study fails to confirm the hypothesis that the type of undergraduate institution influences performance on components of the Physical Therapist Clinical Performance Instrument. There is virtually no difference on clinical performance based on undergraduate institution type.

INTRODUCTION

Future clinicians, including physical therapists, need to treat the entire patient, not just a disease or injury. Understanding pre-enrollment factors that may predispose or enhance a physical therapy student's ability to be best suited to meet all the needs of the patient is of interest. Limited literature exists that links baccalaureate level curricula and ultimate affective and clinical ability. As American tertiary education moves to skill-based or competency-based curricula, we want to examine the role of liberal arts undergraduate education in developing future clinicians' requisite affective dispositions.

The value of a liberal arts education has received a lot of recent attention in the media. Liberal arts, in the context of this study, is defined as a major in a discipline in the sciences, the humanities, or the social sciences (not a pre-professional undergraduate track). Employers often equate liberal arts graduates with enhanced critical thinking skills, heightened intellectual curiosity, abilities to work in teams and better communication skills.¹ While some question the contemporary role of this education framework, empirical studies continue to demonstrate the sustained value of liberal arts training. A recent report sponsored by the National Center for Higher Education Management Systems (NCHEMS) and the Association of American Colleges and Universities (AAC&U) discusses these issues.² In an analysis of the report authors noted, "Whatever undergraduate major they may choose, students who pursue their major within the context of a broad liberal education substantially increase their likelihood of achieving long-term professional success."³ This study looks at the association, if any, between attending an undergraduate institution that emphasizes the liberal arts and ultimate professional success in physical therapy.

While columnists in popular media publications and state-level politicians – including former North Carolina Governor Pat McCrory – remain critical of liberal arts education because of the perceived inability of liberal arts majors to gain and to maintain gainful employment, current research does not uphold this claim.⁴ CEOs and major employer satisfaction surveys report the

immediate need for employees who can think critically, calculate logically, and communicate effectively; as such, the call for liberal arts graduates remains.⁵

Not only are liberal arts skill sets in demand, but employers are willing to compensate workers with these skill sets. The NCHEMS/AAC&U study found liberal arts majors earn more than professional majors at peak earning ages. According to the report analysis,

At peak earnings ages (56 to 60 years) workers who majored as undergraduates in the humanities or social sciences earn annually on average about \$2000 more than those who majored as undergraduates in professional or pre-professional fields. These data include all college graduates working full-time, including those with only a baccalaureate degree and those with both a baccalaureate and graduate or professional degree.³

The interest in students with liberal arts training is true not only in the ultimate workplace, but also in professional schools. Janeksela states, "The liberal arts contribute to professional programs by demonstrating the connections between the liberal arts and the professions, by preparing students who have transferable knowledge and skills, and by preparing graduates who can provide leadership in the workplace and for the profession."⁶ Increasingly, professional schools are looking for liberal arts graduates to populate their incoming classes. The Medical College Admissions Test (MCAT) recently added questions from the social sciences and humanities to the exam, exemplifying this shift. Other clinically-based professions also require skill sets typically associated with liberal arts training. Physical therapy is one such example.

Admission to health sciences professional training programs requires prerequisite coursework that emphasizes the basic sciences. As part of the application process to Doctor of Physical Therapy programs in the United States (DPT), applicants are required to fulfill a set of prerequisite courses.⁷ Though each school may have slight differences in their list of required prerequisites, there are consistent trends that indicate a strong preference for science coursework. For the 2015-16 application cycle, the Physical Therapy Centralized Application Service (PTCAS) released statistics indicating that greater than 92% of the programs required at least one prerequisite course to be taken in each of the following: anatomy and physiology, chemistry, physics, and behavioral science.⁸ Additionally, 87% of programs required applicants to have taken at least once additional course in biological sciences, separate from their anatomy and physiology.

In contrast, only 21% of programs required one prerequisite course in English composition or writing. Communication courses were required by only 9% of programs. Only 6% of programs required a non-communications humanities course. Fewer than 3% of programs required an ethics course prior to admission.⁷ This disconnect between employers' calls for liberal arts graduates and the coursework required to gain acceptance to professional physical therapy programs merits further study.

Following admission and matriculation into a DPT program, students spend on average 123 weeks to earn a doctoral degree in physical therapy.⁹ The curricula in DPT programs is not limited to clinical sciences. The Commission on Accreditation in Physical Therapy Education (CAPTE) requires the following major areas of instruction for all DPT programs necessary for entry level practice: 1) foundational sciences (e.g. biological sciences, physical sciences, movement sciences); 2) social and behavioral sciences (e.g. communication, ethics, values, management, finance, teaching, clinical reasoning); 3) clinical sciences (i.e. management of patients with musculoskeletal, neuromuscular, cardiovascular, metabolic, or integumentary concerns); and 4) practice skills and knowledge.¹⁰

Though each DPT program must demonstrate that it possesses a curriculum that sufficiently instructs students in all of these areas, CAPTE is not prescriptive about the amount of time a program emphasizes any individual level. The ultimate measure of a successful curriculum is its students' ability to successfully pass the National Physical Therapy Examination (NPTE). This examination, required for licensure in any state in the United States, covers all of the same aspects of knowledge described in the CAPTE requirements above. However, less than 2% of the questions are related to topics similar to preparation in the social sciences, ethics, or humanities. The Federation of State Boards of Physical Therapy (FSBPT) indicates that 2% of the questions on any NPTE may fall under "professional responsibilities" defined as "the responsibilities of health-care providers to ensure that patient/client management and health-care decisions take place in a trustworthy environment."¹¹ With this in mind, it is important to examine the relationship between liberal arts exposure and training at the undergraduate level and professional school outcomes.

This study seeks to investigate any association between pre-enrollment curricula and clinical performance in professional physical therapy school. Specifically, we hypothesized that the type of undergraduate institution (those with arts and sciences curricular foci compared to professional curricular foci) influences performance on components of the Physical Therapist Clinical Performance Instrument.¹²⁻¹⁴

METHODS

This study was a retrospective quantitative review of student educational records from the Duke Doctor of Physical Therapy (DPT) classes of 2013 to 2016. The students all enrolled in the DPT program in Durham, NC. The study was approved for exemption by the Duke Medicine Institutional Review Board (Pro0006938). Admissions records and final Clinical Performance Instrument (CPI) internship scores of the students in the classes of 2013-2016 were included for a total 247 students. Records of those students who completed a degree beyond a baccalaureate (n=12) or those who had not completed the academic program (n=2) were excluded from analysis. The total subject records analyzed following exclusions was 233.

Variables

The variable of interest in this study were performance scores on the Clinical Performance Instrument (CPI). This instrument, a standardized and validated tool, requires the students' clinical instructor to assess the students' performance on 18 performance criteria that relate to quality of patient care (see Table 1).¹²⁻¹⁴ The CPI is a nationally normed instrument that is used by most physical therapy programs across the country. The CPI is a series of 21-point rating scale items, designed to reflect a continuum of performance, that were broken into six anchor definitions that range from "beginning performance" (1) to "beyond entry level" (21). The CPI was administered during students' three 12-week clinical internships during their final year in the academic program. Midterm scores in each of the 18 performance criteria were aggregated across the three internships. Likewise, final CPI scores were aggregated.

Table 1. Physical Therapist Clinical Performance Instrument 18 Performance Criteria

Criterion Number	Performance Criterion
1	Safety
2	Professional Behavior
3	Accountability
4	Communication
5	Cultural Competence
6	Professional Development
7	Clinical Reasoning
8	Screening
9	Examination
10	Evaluation
11	Diagnosis and Prognosis
12	Plan of Care
13	Procedural Interventions
14	Educational Interventions
15	Documentation
16	Outcomes Assessment
17	Financial Resources
18	Direction and Supervision of Support Personnel

The independent variable in the study is "Type of Undergraduate Institution" operationalized by the Carnegie Undergraduate Instructional Program Classification system.¹⁵ The researchers used the Carnegie Classifications because they are standard in the field of education research, and because this classification schema can serve as a proxy for exposure to a liberal arts curriculum.¹⁶ Admissions records were reviewed for the undergraduate institutions of all subjects included in the study revealing 150 different institutions. The Carnegie "Institution Lookup" was used to identify the undergraduate instructional program type revealing study participants graduated from programs of 14 different classifications out of the 22 possible assigned by Carnegie. (see Appendix 1).¹⁷

Statistics

For the purposes of analysis, the 14 classifications were first consolidated into five categories (see Appendix 1) arts and sciences focused (input variables 8-10) (n = 15); 2) arts and sciences plus professions (input variables 11-13) (n=45); 3) balanced arts and sciences/professions (input variables 14-16) (n=96); 4) professions plus arts and sciences (input variables 18-19) (n=63); and 5) professions focus (input variables 21-22) (n=5). In order to increase the sample size in the professions-focused classifications, further consolidation was performed to four categories. These are: 1) arts and sciences focused (input variables 8-10) (n = 15); 2) arts and sciences plus professions (input variables 11-13) (n=45); 3) balanced arts and sciences/professions

(input variables 14-16) (n=96); 4) professions focus (input variables 18-22) (n=68).

Kruskal-Wallis tests were used to determine significance of the independent variables, as Kruskal-Wallis is useful for determining significant differences between two or more groups of an independent variable when studying an ordinal dependent variable.¹⁸ Researchers used pairwise comparisons to view post-hoc analyses following the discovery of significant results from the Kruskal-Wallis tests. All analyses were performed using IBM SPSS Statistics for Windows version 22.0 (IBM Co., Armonk, NY, USA).

RESULTS

When the Carnegie Classifications were consolidated to five categories, there was only a significant difference in score for one of the 108 possible scales (18 criteria x 6 evaluations per criterion) in the CPI (Professional Behavior, Final 3) (see Table 2). Students who attended an undergraduate institution with a professional focus (category 5) scored significantly ($p=.033$) higher on this Professional Behavior scale than did students who attended an undergraduate institution with an arts and sciences focus (category 1). There were no significant differences between students who completed their undergraduate degree at various institution types on any other CPI scale. The p-values in Tables 2-3 indicate the overall significance of the difference between any of the five categories at that time point; the p-values delineated below each table refer to the results of the post hoc analysis and are limited to the significance of the difference between the two noted samples.

Table 2: Five Carnegie Groups

CPI Indicator	Asymp. Sig.					
	Midterm 1	Final 1	Midterm 2	Final 2	Midterm 3	Final 3
Safety	0.875	0.654	0.925	0.977	0.800	0.271
Professional Behavior	0.304	0.721	0.986	0.941	0.941	.027*^
Accountability	0.054	0.615	0.755	0.661	0.925	0.075
Communication	0.351	0.668	0.648	0.804	0.628	0.234
Cultural Competency	0.366	0.859	0.783	0.968	0.776	0.230
Professional Development	0.807	0.736	0.529	0.827	0.792	0.246
Clinical Reasoning	0.613	0.703	0.981	0.380	0.113	0.475
Screening	0.380	0.430	0.423	0.968	0.325	0.495
Examination	0.849	0.882	0.694	0.848	0.141	0.261
Evaluation	0.608	0.658	0.697	0.580	0.691	0.595
Diagnosis and Prognosis	0.665	0.339	0.876	0.630	0.531	0.601
Plan of Care	0.373	0.779	0.964	0.421	0.264	0.362
Procedural Intervention	0.154	0.732	0.953	0.503	0.619	0.644
Educational Intervention	0.201	0.749	0.829	0.819	0.312	0.474
Documentation	0.224	0.661	0.865	0.624	0.880	0.783
Outcomes Assessment	0.423	0.768	0.380	0.361	0.253	0.237
Financial Resources	0.229	0.822	0.892	0.861	0.155	0.154
Direction and Supervision of Personnel	0.189	0.880	0.609	0.926	0.437	0.575
* $p<.05$; ^sample1<sample5 ($p=.033$)						

When the Carnegie Classifications were consolidated to four categories, two scales showed significant results (Professional Behavior, Final 3; Accountability, Final 3) (see Table 3). As was the case with the five-category classification, students who attended an undergraduate institution with a professional focus (category 4) scored significantly ($p=.024$) higher on the third Professional Behavior final scale than students who attended an undergraduate institution with an arts and science focus (category 1). Additionally, students who attended an undergraduate institution with a professional focus (category 4) scored significantly ($p=.048$) higher on the third Accountability final scale than students who attended an undergraduate institution with an arts and science focus (category 1). There were no significant differences between students who completed their undergraduate degree at various institution types on any other CPI scale.

Table 3: Four Carnegie Groups

CPI Indicator	Asymp. Sig.					
	Midterm 1	Final 1	Midterm 2	Final 2	Midterm 3	Final 3
Safety	0.834	0.849	0.859	0.928	0.722	0.161
Professional Behavior	0.578	0.707	0.950	0.858	0.918	.038* [^]
Accountability	0.221	0.040	0.805	0.564	0.830	.046* [~]
Communication	0.291	0.800	0.546	0.698	0.460	0.143
Cultural Competency	0.325	0.750	0.883	0.988	0.625	0.142
Professional Development	0.658	0.738	0.408	0.722	0.761	0.143
Clinical Reasoning	0.498	0.657	0.992	0.405	0.083	0.343
Screening	0.452	0.616	0.795	0.950	0.199	0.368
Examination	0.924	0.835	0.878	0.754	0.146	0.150
Evaluation	0.564	0.697	0.861	0.493	0.569	0.477
Diagnosis and Prognosis	0.589	0.586	0.930	0.555	0.367	0.511
Plan of Care	0.277	0.696	0.991	0.465	0.189	0.253
Procedural Intervention	0.084	0.573	0.876	0.411	0.511	0.475
Educational Intervention	0.262	0.729	0.781	0.687	0.215	0.320
Documentation	0.138	0.445	0.736	0.466	0.856	0.635
Outcomes Assessment	0.390	0.745	0.566	0.244	0.176	0.137
Financial Resources	0.437	0.814	0.874	0.739	0.128	0.083
Direction and Supervision of Personnel	0.309	0.798	0.775	0.960	0.358	0.408
* $p<.05$; [^] sample1<sample4 ($p=.024$); [~] sample1<sample4 ($p=.048$)						

DISCUSSION

With few exceptions, the type of undergraduate institution a future physical therapist attended does not affect his/her ultimate clinical abilities, as measured by the CPI at the end of formal physical therapy training. The exceptions include professional behavior and accountability at the last assessment of the program, when future clinicians who attended undergraduate institutions with a professional focus score significantly higher on the CPI scales than do future clinicians who attended undergraduate institutions with an arts and science focus ("liberal arts" colleges). The study fails to confirm the hypothesis that the type of undergraduate institution influences performance on components of the Physical Therapist Clinical Performance Instrument; there is virtually no difference on clinical performance based on undergraduate institution type.

In the context of the contemporary discussion about the role and value of a liberal arts education, this study suggests that students who do not explicitly study a pre-clinical, pre-professional curriculum as undergraduates are, for the most part, equally skilled clinicians, both in terms of their affective dispositions around patient interaction and in terms of their clinical abilities. This study confirms previous studies that found liberal arts graduates have transferable skills and students, regardless of undergraduate curricular emphasis, can thrive in professional school and, ultimately, in the professional workforce.

It is worth noting that the only significant differences between students with diverse undergraduate backgrounds occur at the end of their formal physical therapy training. If these differences were evident earlier in the training, one could speculate that either the pre-professional undergraduate training or simply the proximity and proximal interaction with professional student and

faculty may impact students' professional behavior and sense of accountability. Because the few significant differences are not apparent until the end of the professional training, it is virtually impossible to make any causal inference about the impact of undergraduate curricula and physical therapy skillsets. Additional research is necessary to determine if there are differences in the non-clinical sciences curricular elements during a DPT program that may better explain these performance differences on the final clinical internships.

One of the limitations of this study is the researchers did not control for selectivity of undergraduate institution; perhaps the selectivity of undergraduate institution is a compounding variable that ultimately impacts professional behavior and accountability. Again, since the differences by undergraduate institution type are manifested in the final CPI evaluation, perhaps the difference is due to a disparity in social or cultural capital that are exacerbated over time rather than being impacted by undergraduate institution type. There are additional limitations to this study. Clinical student data was used from only one institution so results may not be generalizable across all physical therapy programs. The study only analyzed student data in the aggregate due to the sample sizes available. Additional research is needed to analyze the impact of undergraduate institution type on various student sub-populations (including gender, race, ethnicity, selectivity of school, and others).

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Appendix 1: Carnegie Classification Descriptors and Model Groupings

Carnegie Classification	Description	Input Variable	Code for Model 1	Code for Model 2
Associate's Colleges: High Transfer	These institutions awarded associate's degrees but no bachelor's degrees with fewer than 30% of awards (degrees and certificates) in career & technical programs.	1		
Associate's Colleges: Mixed Transfer/Career & Technical	These institutions awarded associate's degrees but no bachelor's degrees with 30-49% of awards (degrees and certificates) in career & technical programs.	2		
Associate's Colleges: High Career & Technical	These institutions awarded associate's degrees but no bachelor's degrees with more than 50% of awards (degrees and certificates) in career & technical programs.	3		
Special Focus Two-Year Institutions	These institutions awarded associate's degrees but no bachelor's degrees with typically more than 75% of awards in a single career & technical program.	4		
Special Focus Four-Year Institutions	These institutions awarded bachelors and higher degrees with typically more than 75% of degrees in a professional program.	5		
Tribal Colleges	Colleges and universities that are members of the American Indian Higher Education Consortium, as identified in IPEDS Institutional Characteristics.	6		
Baccalaureate/Associate's Colleges	These institutions awarded both associates and bachelor's degrees, but the majority of degrees awarded were at the associate's level.	7		
Arts & sciences focus, no graduate coexistence	At least 80 percent of bachelor's degree majors were in the arts and sciences, and no graduate degrees were awarded in fields corresponding to undergraduate majors.	8	1	1
Arts & sciences focus, some graduate coexistence	At least 80 percent of bachelor's degree majors were in the arts and sciences, and graduate degrees were observed in up to half of the fields corresponding to undergraduate majors.	9	1	1
Arts & sciences focus, high graduate coexistence	At least 80 percent of bachelor's degree majors were in the arts and sciences, and graduate degrees were observed in at least half of the fields corresponding to undergraduate majors.	10	1	1
Arts & sciences plus professions, no graduate coexistence	60-79 percent of bachelor's degree majors were in the arts and sciences, and no graduate degrees were awarded in fields corresponding to undergraduate majors.	11	2	2
Arts & sciences plus professions, some graduate coexistence	60-79 percent of bachelor's degree majors were in the arts and sciences, and graduate degrees were observed in up to half of the fields corresponding to undergraduate majors.	12	2	2
Arts & sciences plus professions, high graduate coexistence	60-79 percent of bachelor's degree majors were in the arts and sciences, and graduate	13	2	2

	degrees were observed in at least half of the fields corresponding to undergraduate majors.			
Balanced arts & sciences/professions, no graduate coexistence	Bachelor's degrees awarded were relatively balanced between arts and sciences and professional fields (41–59 percent in each), and no graduate degrees were awarded in fields corresponding to undergraduate majors.	14	3	3
Balanced arts & sciences/professions, some graduate coexistence	Bachelor's degree majors were relatively balanced between arts and sciences and professional fields (41–59 percent in each), and graduate degrees were observed in up to half of the fields corresponding to undergraduate majors.	15	3	3
Balanced arts & sciences/professions, high graduate coexistence	Bachelor's degree majors were relatively balanced between arts and sciences and professional fields (41–59 percent in each), and graduate degrees were observed in at least half of the fields corresponding to undergraduate majors.	16	3	3
Professions plus arts & sciences, no graduate coexistence	According to the degree data, 60–79 percent of bachelor's degree majors were in professional fields (such as business, education, engineering, health, and social work), and no graduate degrees were awarded in fields corresponding to undergraduate majors.	17	4	4
Professions plus arts & sciences, some graduate coexistence	60–79 percent of bachelor's degree majors were in professional fields, and graduate degrees were observed in up to half of the fields corresponding to undergraduate majors.	18	4	4
Professions plus arts & sciences, high graduate coexistence	60–79 percent of bachelor's degree majors were in professional fields, and graduate degrees were observed in at least half of the fields corresponding to undergraduate majors.	19	4	4
Professions focus, no graduate coexistence	At least 80 percent of bachelor's degree majors were in professional fields (such as business, education, engineering, health, and social work), and no graduate degrees were awarded in fields corresponding to undergraduate majors.	20	5	4
Professions focus, some graduate coexistence	At least 80 percent of bachelor's degree majors were in professional fields, and graduate degrees were observed in up to half of the fields corresponding to undergraduate majors.	21	5	4
Professions focus, high graduate coexistence	At least 80 percent of bachelor's degree majors were in professional fields, and graduate degrees were observed in at least half of the fields corresponding to undergraduate majors.	22	5	4