Career Factors Help Predict Productivity in Scholarship Among Faculty Members in Physical Therapist Education Programs

Regina R Kaufman

Background. Academic institutions and scholars play a critical role in the development of a unique and substantive professional science and disciplinary literature. Individual and environmental characteristics influence the scholarly work of higher education faculty generally, but little is known about factors that influence scholarly productivity of physical therapist faculty members.

Objective. The purpose of this study was to identify the factors that contribute to the variability in scholarly productivity among faculty members in physical therapist education programs.

Design. A cross-sectional study design was used.

Methods. A survey of a representative sample of faculty members in accredited professional (entry-level) physical therapist education programs in the United States was conducted. Descriptive analysis was conducted, and 5 blocked hierarchical regression models were constructed to identify factors that help explain variability in grantsmanship, peer-reviewed publications, and peer-reviewed presentations.

Results. A usable response rate of 58% was obtained. The 520 participants displayed variability in scholarly productivity. The regression models explained half of the variance in career publishing productivity and 28% to 44% of the variance in productivity in presentations and grants. Career factors, including discipline of highest degree, appointment status, and faculty rewards, contributed most substantially to the explained variance. Several phenomena unique to physical therapy were considered in light of these findings. The multidisciplinary nature of the faculty, national trends in faculty hiring and appointment, and the status of the DPT-trained faculty cohort all may influence physical therapy faculty scholarship.

Limitations. Unidentified errors in sampling or reporting may limit the results of this study.

Conclusions. Career factors generally predict the largest proportion of explained variance in scholarly productivity. Large numbers of questions remain regarding the status of scholarship and scholars in physical therapy.
Scholarly activity in the forms of discovery, integration, application, and teaching results in the extension and transformation of knowledge. Scholarly activity is considered the purview of higher education institutions. Faculty scholars play a critical role in the development of disciplinary literature. Leaders within the American Physical Therapy Association (APTA) advocate strongly that every core faculty member in physical therapist professional (entry-level) education programs demonstrate engagement in scholarship. The evaluative criteria for accreditation of professional programs articulate expectations that each core faculty member fulfill his or her role as scholar in a consistent and substantial manner. The APTA has promoted efforts toward developing a comprehensive body of evidence for practice through formulation of the Clinical Research Agenda (CRA) for physical therapy.

Scholarly products include publications, presentations, grants, and other scholarly works. Fulfillment of the scholarly role often is evaluated in terms of scholarly productivity by measuring the quantity of scholarly works published or presented. Despite efforts to elevate the status of other scholarly products, the peer-reviewed journal article is generally the most highly regarded form of scholarly work. Efforts to quantify scholarly productivity often use the number of peer-reviewed journal publications as the unit of interest. Faculty rewards, including tenure and promotion, are dependent, in part, on the volume and characteristics of scholarly works produced throughout the faculty member’s academic career.

Scholarly productivity of higher education faculty members has been examined from a variety of perspectives. Characteristics such as gender, disciplinary affiliation, institutional type, appointment, and rank are all connected, either directly or indirectly, to scholarly productivity in general and to publishing productivity in particular. Factors influencing productivity tend to have directional effects. Female gender has a negative influence on publishing productivity, either directly or indirectly, as a result of gender patterns in disciplinary and institutional affiliation, workload, and faculty rewards. Faculty in research-intensive institutions publish more than faculty in teaching-intensive settings due to institutional resources and time allocation that favor scholarly work. Although the relationship of publishing productivity to promotion appear equivocal, most faculty agree that achievement of tenure and promotion is difficult without a sufficient quantity of scholarly publications.

Two conceptual frameworks are useful to consideration of scholarly productivity of physical therapist academics. First, disciplinary structure and culture influence processes and products of scholarly endeavor. Structure refers to content matter and inquiry processes that characterize disciplinary fields. Fields identified as “hard,” or paradigmatic, hold distinct bodies of knowledge and utilize fixed theoretical frameworks and modes of inquiry to develop the disciplinary substance. Physical and biological sciences are examples of paradigmatic disciplines. “Soft,” or nonparadigmatic, fields have poorly delineated boundaries, loosely defined bodies of knowledge, and a variety of interpretive frames and methodological approaches to advancing the discipline’s knowledge. Anthropology and sociology are examples of nonparadigmatic disciplines. The discipline of physical therapy, drawing upon an array of sciences and utilizing a variety of interpretive frames and research methods, is a nonparadigmatic discipline.

Disciplinary culture is reflected in types of activities, strategies for collaboration, modes of communication, and patterns of socialization practiced by disciplinary scholars. Paradigmatic disciplinary scholars (PDS) are socialized to the problems of the discipline and engage in collaborative, competitive, and fast-paced scholarly activity. Nonparadigmatic disciplinary scholars (NPDS) receive little socialization to central concerns of the discipline and often represent a broad range of problems within any given field. They usually work singly or in small groups, with relatively little competition and little support and at a slower pace than PDS.

Differences in structural and cultural characteristics of disciplines are associated with varying patterns of scholarly productivity. Differences include numbers and types of venues for publications and presentations. Works by PDS generally appear earlier in their career and with greater frequency than those by NPDS. The PDS are more likely to publish peer-reviewed journal articles, whereas NPDS are more likely to publish books and other types of nonjuried products.

The condition of physical therapy as a nonparadigmatic discipline may influence both the volume and qualities of the profession’s scholarship. Physical therapy, as a soft field, would be inclined toward lower and slower rates of publication. Additionally, physical therapy has a multidisciplinary academy. Although the number of physical therapist faculty holding academic doctoral degrees has grown significantly over the last several decades, those degrees represent many different academic fields, suggesting the research agendas of physical therapist faculty may be widely divergent, with some inclined to greater productivity than others, based in part on disciplinary...
Predicting Productivity in Scholarship

affiliation.27 How the nature of the discipline and the multidisciplinary nature of the faculty influence the academy’s scholarly productivity has not been explored.

The second body of literature guiding consideration of physical therapist faculty scholarship addresses scholarly productivity of higher education faculty generally. Blackburn and Lawrence31 developed a conceptual framework that encompasses the variety of factors that influence scholarly productivity. Their framework includes 7 antecedents characterized as individual or environmental in nature. Individual antecedents include sociodemographic variables such as gender, career factors such as the academic discipline, and self-knowledge such as insight into institutional culture. Environmental antecedents include environmental conditions such as institutional mission, environmental responses such as faculty rewards of tenure and rank, and personal social contingencies such as family responsibility.

Little is known about how individual or environmental antecedents influence the scholarly productivity of faculty members in physical therapist education programs. Historically, individual physical therapist faculty scholarly productivity appears to be quite low.28,29 The mean number of article publications was 1.33 per subject, with 43% of respondents reporting no publications, in a 1987 study of 127 faculty members.29 Recently, Richter and colleagues32 measured physical therapist program publishing productivity and found that half of the programs sampled had fewer than 5 citations in the PubMed and CINAHL databases for the 5-year period studied. Higher numbers of per-program citations were associated with research and doctoral-level institutions. That study was limited in several regards. Productivity was described per academic unit and not per academician. In addition, the bibliographic search strategy was limited by design and, therefore, omitted citations by contributing authors and authors of works indexed in other bibliographic databases.

No study has analyzed factors that contribute to scholarly productivity of individual physical therapist faculty members. The purpose of this study was to develop and test a model to help explain how individual, career, institutional, and work factors help explain variability in peer-reviewed publications, peer reviewed presentations, and peer reviewed grant awards of individual physical therapist academicians.

Method
This cross-sectional study used survey methods. Submission of a completed survey questionnaire by a participant signified informed consent.

Instrumentation
A 49-question survey (eAppendix; available at www.ptjournal.org) was developed to capture information regarding sociodemographic characteristics, environmental factors, career factors, work factors, and numbers of peer-reviewed and non–peer-reviewed scholarly products. Survey variables were based on the framework of Blackburn and Lawrence.31 The survey was modeled after questionnaires used by the Higher Education Research Institute33 and the National Center for Education Statistics National Study of Postsecondary Faculty.34 The survey was constructed in online and paper formats using identical text and minor differences in layout.

A pilot test evaluated the survey instrument for test-retest consistency, format consistency, and face and content validity. The 17 pilot study participants were 12 physical therapy faculty volunteers not included in the current study sample and 5 faculty members from a professional program in occupational therapy. Participants completed the online version of the survey questionnaire twice, at 1-week intervals. They completed the paper version of the survey questionnaire once, 1 month following the first online submission. Percentage of agreement was assessed for each item across electronic and paper submissions. Items with less than 75% agreement were edited for clarity and precision. Additional written comments affirmed face and content validity and resulted in minor clarifications in survey language.

Participants
A stratified random sampling procedure was used to obtain the study sample. A sampling frame of 1,735 full-time faculty members from 188 accredited physical therapist education programs in the United States was developed in January 2006 through review of program Web sites and personal contact with each program. Information for faculty from the remaining programs was not confirmed, and they were excluded from the sampling frame. The 188 programs were stratified by institutional type based on their 2000 Carnegie classification35 (research/doctoral, master’s, baccalaureate, specialized) and by size (small=4–7 faculty, medium=8–10 faculty, large=11 or more faculty), creating 12 categories. Programs were sampled at random from within each category using the random case selection function in SPSS base version 14.0.36,37 Every faculty member in each program selected was surveyed. The final sample consisted of 97 programs and 881 faculty members.

SPSS Inc, 233 S Wacker Dr, Chicago, IL 60606.
Data Collection
The survey dissemination process involved Web-based and standard mailing procedures. The Survey Monkey service was used for online administration. An e-mail invitation was sent to all participants. Participants who followed an embedded link to the survey questionnaire were able to complete the survey and submit responses online. Two additional e-mail invitations were sent to nonrespondents 7 days and 14 days following initial contact. Three weeks following initial contact, a final request for participation and a paper copy of the survey questionnaire with a postage-paid return envelope were sent to remaining nonrespondents via standard mail.

Data Analysis
A total of 568 participants responded to the survey. Of those respondents, 519 submitted their questionnaire via the survey Web site and 49 submitted their questionnaire on paper. Any respondent who failed to provide data pertaining to scholarly productivity was omitted. The final number of usable responses was 520, for a final response rate of 58%.

A wave analysis was used to assess for nonresponse bias. A wave analysis identifies differences between early and late responders. If early responders are different from late responders, they also probably are different than nonresponders, and nonresponse bias is of concern. There were no consistent patterns in response characteristics, including gender, highest degree, institutional type, and number of career article publications, that would suggest early and late responders were different from each other.

The SPSS base version 14.0 was used to calculate measures of central tendency, frequencies, and cross tabulations for selected demographic, environmental, career, work, and productivity factors.

A regression analysis was conducted using a blocked hierarchical design. Five regression models were constructed for dependent variables of career grant awards, career peer-reviewed article publications, 2-year peer-reviewed article publications, career peer-reviewed presentations, and 2-year peer-reviewed presentations. The choice of dependent variables was based on the primacy of the peer-reviewed publication in the evaluation of scholarly productivity, the relatively higher frequency of presentations than publications within the study data, and the enabling value of grant support to scholarly work.

The selection of independent variables was based on Blackburn and Lawrence’s framework. The blocks represented both individual and environmental factors and included demographic, institutional, career, and work characteristics. As previously noted, “career grant awards” was the dependent variable for the first model. Career grant awards also was included as the fifth independent block variable for the remaining 4 models. In addition to their usefulness as a measure of scholarly productivity, grants enable productivity in publication and presentation.

“Discipline of highest degree” was included with the career factors block because of the multidisciplinary composition of the physical therapy academy and the presumed influence of disciplinary affiliation on scholarly work.

Role of the Funding Source
This study was funded, in part, by the Springfield College Faculty Research Fund. Springfield College played no role in the design, conduct, or reporting of the study.

Results
A description of the participants, levels of scholarly productivity, results of the regression analyses, and descriptive information for selected variables pertaining to “career factors” are presented. Participant characteristics are provided in Table 1. Seventy-three percent of the participants were female, and almost all of the participants were white. Almost half of the participants held the PhD as the highest degree. More than half of the participants were tenured or on a tenure track, and a large majority were assistant or associate professors. Approximately 40% of the participants worked in research or doctoral institutions. The participants represented 32 different academic fields within the disciplines of their highest degrees (Tab. 2). Approximately 65% of those reporting were affiliated with soft academic disciplines (Tab. 2). Using the 2005 Fact Sheet for Physical Therapist Education Programs for comparison, the sample was representative of the national faculty.

Participants varied widely in the extent to which they were productive as scholars (Tab. 3). They engaged in peer-reviewed presentations to a greater extent than peer-reviewed article publication, and they engaged in both activities to a greater extent than other activities. For purposes of further discussion, results will focus on peer-reviewed article publications, peer-reviewed presentations, and grants. The terms “nonpublishers” and “nonpresenters” will refer to those respondents who did not had a product in either of those peer-reviewed categories. Nearly 20% of the respondents were nonpublishers, and more than 10% were nonpresenters. Just 12.5% of the participants had published more than 20 peer-reviewed articles.

The results of the regression models are presented in Table 4. The models...
### Table 1.
Characteristics of Physical Therapist Faculty Participants

| Characteristics | Percentage of Sample | Comparison Data (%) From 2005 CAPTE Fact Sheet |
|-----------------|----------------------|-----------------------------------------------|
| **Sex (n=518)** |                      |                                               |
| Male            | 37.1                 | 37                                            |
| Female          | 62.9                 | 63                                            |
| **Race/ethnicity (n=508)** |          |                                               |
| Asian American/Asian | 2.7         | 3                                              |
| African American/black | 1.8       | 2                                              |
| Native Hawaiian/Pacific Islander | 0.2 | NA                                              |
| Hispanic/Latino | 2.0                  | 2                                              |
| White/Caucasian | 93.3                 | 90                                            |
| **Highest degree (n=519)** |       |                                               |
| Baccalaureate   | 0.6                  | NA                                            |
| Master’s        | 24.7                 | 36                                            |
| Transitional DPT| 7.1                  | 4                                             |
| EdD             | 8.9                  | NA                                            |
| PhD             | 48.1                 | 45                                            |
| Other doctorate | 7.7                  | 16                                            |
| Professional (entry-level) physical therapy degree | 2.9 | NA                                              |
| **Disciplinary type (n=482)** |         |                                               |
| Hard or high consensus field | 37             | NA                                            |
| Soft or low consensus field | 63          | NA                                            |
| **Institutional type (n=519)** |      |                                               |
| Research/doctoral | 40.1              | 40                                            |
| Master’s        | 36.0                 | 37                                            |
| Baccalaureate   | 2.9                  | 5                                             |
| Specialized     | 21.0                 | 18                                            |
| **Academic rank (N=520)** |             |                                               |
| Lecturer/instructor | 7.1              | NA                                            |
| Assistant professor | 41.2         | 39                                            |
| Associate professor | 34.0          | 30                                            |
| Professor       | 14.6                 | 12                                            |
| Other           | 3.1                  | NA                                            |
| **Appointment status (n=519)** |       |                                               |
| No tenure system | 11.9               | NA                                            |
| Not on tenure track | 31.2         | 26                                            |
| On tenure track  | 25.0                 | 26                                            |
| Tenured         | 31.9                 | 29                                            |
| **Position (n=519)** |               |                                               |
| Core faculty    | 69.1                 | 78                                            |
| ACCE/DCE        | 10.2                 | 11                                            |
| Chair/director  | 11.8                 | 10                                            |
| Other           | 8.9                  | NA                                            |

* CAPTE—Commission on Accreditation in Physical Therapy Education, DPT—Doctor of Physical Therapy, ACCE/DCE—academic coordinator of clinical education/director of clinical education.

* Variation in number of participants is due to missing data.

* None available (no comparison data are available).

* This includes EdD and other postprofessional doctoral degrees, excluding the PhD and DPT.
explained from one quarter to one half of the variance for each of the dependent variables. Generally, career factors predicted the largest proportion of explained variance. The first model explained 36% of the variability in career grant awards. Career factors accounted for more than half of the explained variance, and demographic attributes contributed 7.9%. The second model explained half of the variance in career peer-reviewed article publications, with career factors contributing 17% and demographic factors contributing 12.4%. The third model predicted 41.2% of the variance in career presentations. Career factors again predicted the largest portion of the variance at 15.2%. The fourth model explained 44.4% of the variance in 2-year publications. Work factors predicted the largest proportion of the variance at 18.6%, and career factors were the second-largest predictor at 16.6%. The fifth model explained just more than one fourth of the variance in 2-year presentations. The career factors block again predicted the largest proportion of the variance (12.7%).

Because career factors tended to predict the largest proportion of explained variance, additional descriptive information is provided regarding career factors. In areas of rank and tenure status, faculty with non-tenure track appointments were more likely to be nonpublishers and less likely to be high-frequency publishers than faculty with tenure track appointments (Tab. 5). In relation to type of doctoral degree (Tab. 6), the 2-year publication and presentation rates for the Doctor of Physical Therapy (DPT)-trained faculty were lower than for any other type of doctorally prepared faculty member. The DPT-trained faculty were least likely of all of the doctorally prepared faculty to prefer the research component of their work. Approximately 78% of the DPT-trained faculty either were working without a tenure system or were not on a tenure track. As regards productivity across disciplinary types, participants holding the highest degrees in paradigmatic fields were more likely to be higher-frequency publishers and less likely to be lower-frequency publishers than NPDS (Tab. 5). The PDS were more likely than the NPDS to engage in scholarship of discovery and basic or applied science research (Tab. 7). The PDS were less likely than the NPDS to direct explicit attention toward the CRA.

Table 2.
Second Disciplines of the Faculty Sample

| Discipline                        | Frequency | %  | Type |
|----------------------------------|-----------|----|------|
| Administration                   | 18        | 3.5| Soft |
| Anatomy                          | 24        | 4.6| Soft |
| Biochemistry                     | 1         | 0.2| Hard |
| Biology                          | 5         | 1.0| Hard |
| Biomechanics                     | 16        | 3.1| Hard |
| Biomedical engineering           | 5         | 1.0| Hard |
| Biomedical sciences              | 4         | 0.8| Hard |
| Chiropractic                     | 1         | 0.2| Soft |
| Computer technology              | 2         | 0.4| Hard |
| Conflict resolution              | 1         | 0.2| Soft |
| Corporate communications         | 1         | 0.2| Soft |
| Education                        | 82        | 15.8| Soft |
| Engineering                      | 2         | 0.4| Hard |
| Epidemiology and biostatistics   | 9         | 1.7| Soft |
| Ergonomics                       | 4         | 0.8| Hard |
| Ethics                           | 3         | 0.6| Soft |
| Exercise science                 | 41        | 7.9| Hard |
| Genetics                         | 1         | 0.2| Hard |
| Gerontology                      | 2         | 0.4| Soft |
| Health promotion                 | 1         | 0.2| Soft |
| Kinesiology                      | 20        | 3.8| Hard |
| Law                              | 4         | 0.8| Soft |
| Medicine                         | 3         | 0.6| Soft |
| Movement science                 | 15        | 2.9| Hard |
| Neuroscience                     | 13        | 2.5| Hard |
| Pharmacology                     | 4         | 0.8| Soft |
| Physiology                       | 18        | 3.5| Hard |
| Psychology                       | 8         | 1.5| Hard |
| Physical therapy                 | 141       | 27.1| Soft |
| Public health                    | 6         | 1.2| Soft |
| Rehabilitation sciences          | 26        | 5.0| Soft |
| Social work                      | 1         | 0.2| Soft |
| Total                            | 482       |    |      |

* Categorization of hard or soft discipline based on Sax et al.54
Discussion

These results suggest important variations in individual, career, and work factors that influence scholarly productivity of physical therapist academicians. The factors identified, in the context of the evolving academic culture of the physical therapy profession, raise important questions about the status of scholarship within the field.

In many ways, the sample in this study is similar to and appears subject to factors affecting higher education faculty generally. Like faculty in many academic fields, these participants displayed variability in peer-reviewed article publications. As noted earlier, about 18% of the physical therapist faculty participants were nonpublishers, and 12.5% had published more than 20 peer-reviewed articles. Across higher education in general, estimates of nonpublishers are around 25%.1,9 Approximately 15% of the faculty produce about 50% of the publications for many fields.9 It appears that physical therapist faculty are similar to faculty at large when it comes to peer-reviewed article publications.

Career factors, including discipline of highest degree, appointment status, and faculty rewards, contributed most substantially to the explained variance. Several phenomena warrant consideration in light of these findings. These phenomena include the multidisciplinary nature of the faculty, the hiring and appointment patterns of the faculty, and the status of the DPT-trained faculty cohort.

The Multidisciplinary Academy Has Strengths and Challenges

The discipline of physical therapy is nonparadigmatic. The profession draws its foundational information from a variety of fields such as physics, anatomy, physiology, psychology, and education.41 The body of knowledge unique to physical therapy is arguably the specialized application of information from disciplines such as exercise science and movement science.42,43 The nonparadigmatic nature of the field may predispose the profession to lower and slower rates of peer-reviewed article publication in particular and of scholarly work in general.23–25

To complicate the issues of disciplinary type and scholarly productivity, the physical therapy academy is multidisciplinary. There were 32 distinct academic fields represented in the degrees earned by the participants in this study (Tab. 2). Nonparadigmatic disciplines accounted for 53% of the academic fields and 63% of the participants. Paradigmatic disciplines accounted for 47% of the academic fields and 37% of the participants. Although some fields, such as movement science, kinesiology, exercise science, and biomechanics, have clear links to the clinical and foundational sciences of physical therapy, other fields, such as biochemistry, corporate communications, and law, are less clearly or directly related.

As noted previously, participants in paradigmatic and nonparadigmatic fields displayed different patterns of scholarly work in several regards. The PDS were more likely to be prolific publishers and less likely to be low-frequency publishers than the NPDS (Tab. 5). The PDS were more likely than the NPDS to engage in scholarship of discovery and to engage in basic or applied science research (Tab. 7). The Commission on Accreditation in Physical Therapy Education (CAPTE) position paper on

Table 3.
Scholarly Products of Physical Therapist Faculty Participants

| Scholarly Products                        | N* | Median (Range) | Levels of Productivity by Percentage of Participants at Each Level |
|-------------------------------------------|----|----------------|------------------------------------------------------------------|
| Career peer-reviewed articles             | 510| 4 (0–75)       | 18.3 23.1 17.1 13.6 27.9                                       |
| Career peer-reviewed presentations       | 517| 8 (0–200)      | 12.8 12.2 17.8 17.0 40.2                                       |
| 2-year peer-reviewed articles             | 519| 1 (0–20)       | 35.8 36.6 17.2 8.1 2.3                                        |
| 2-year peer-reviewed presentations       | 520| 2 (0–40)       | 25.0 30.0 25.0 14.9 5.1                                        |
| Career grant awards                       | 505| 2 (0–43)       | 28.1 26.1 23.6 12.9 9.3                                       |
| Career textbooks                          | 518| 0 (0–19)       | 69.3 18.9 6.8 3.3 1.7                                        |
| Career non–peer-reviewed articles         | 510| 2 (0–65)       | 51.5 23.8 13.9 7.1 3.7                                        |

* Variation in number of participants is due to missing data.
### Table 4.
Predicting Productivity in Scholarship: Summary of Standardized Coefficients

| Independent Variables | β-Weights for Career Grant Awards | β-Weights for Career Peer-Reviewed Articles | β-Weights for Career Presentations | β-Weights for 2-Year Peer-Reviewed Articles | β-Weights for 2-Year Peer-Reviewed Presentations |
|-----------------------|----------------------------------|-------------------------------------------|----------------------------------|-------------------------------------------|----------------------------------|
| Sex                   | .062                             | -.125<sup>a</sup>                        | .043                             | -.060                                    | .054                             |
| Race                  | .051                             | .078<sup>b</sup>                         | .030                             | .051                                      | .044                             |
| Marital status        | .008                             | .045                                      | -.017                            | .015                                      | -.067                            |
| Children              | .062                             | -.076                                    | -.071                            | -.005                                    | .003                             |
| Years as physical therapist | .013                           | .001                                      | .003                             | -.051                                    | -.037                            |
| Years as faculty member | .097                           | .087                                      | .063                             | -.030                                    | -.078                            |
| R² for demographic block | .079                           | .124                                      | .092                             | .019                                      | .012                             |
| Master’s degree-level institution | -.031                        | -.102<sup>b</sup>                       | -.055                            | -.072                                    | -.039                            |
| Specialized institution | -.039                         | -.065                                      | .035                             | -.042                                    | .066                             |
| Urban location        | .085                             | .011                                      | -.033                            | .025                                      | .059                             |
| Rural location        | .007                             | -.073                                    | -.059                            | -.076                                    | -.031                            |
| R² for institutional block | .023                           | .040                                      | .009                             | .043                                      | .010                             |
| No tenure system      | .023                             | .085<sup>b</sup>                         | .054                             | .075                                      | .082                             |
| Tenure track          | .116<sup>b</sup>                 | .060                                      | .030                             | .090                                      | .144<sup>b</sup>                 |
| Tenured               | .180<sup>b</sup>                 | .077                                      | .074                             | .058                                      | .032                             |
| Assistant professor   | -.086                            | .002                                      | .012                             | .004                                      | .003                             |
| Associate professor   | .036                             | .144                                      | .098                             | .035                                      | .073                             |
| Professor             | .142                             | .283<sup>a</sup>                         | .275<sup>a</sup>                 | .072                                      | .219<sup>b</sup>                 |
| Master’s degree       | .067                             | .006                                      | -.013                            | -.080                                    | -.039                            |
| EdD                   | .057                             | -.033                                    | -.076                            | -.073                                    | -.099                            |
| PhD                   | .215<sup>a</sup>                 | -.001                                     | -.093                            | -.014                                    | -.080                            |
| PT/DT/PT<sup>c</sup>  | .066                             | -.018                                    | -.036                            | -.097                                    | -.105                            |
| Hard or soft discipline | -.093<sup>a</sup>               | .033                                      | -.012                            | .058                                      | .097                             |
| R² for career block   | .204                             | .172                                      | .152                             | .166                                      | .127                             |
| Prefer teaching       | -.068                            | .019                                      | .147<sup>b</sup>                 | .005                                      | .083                             |
| Prefer research       | .074                             | .197<sup>a</sup>                         | .227<sup>a</sup>                 | .133<sup>b</sup>                          | .115                             |
| Time teaching         | -.013                            | -.261<sup>a</sup>                        | -.199<sup>a</sup>                | -.165<sup>a</sup>                         | -.187<sup>n</sup>                |
| Time research         | .178<sup>b</sup>                | .008                                      | -.046                            | .270<sup>n</sup>                          | .096                             |
| Time service          | .014                             | -.071                                    | -.040                            | -.007                                    | .023                             |
| Time administration   | -.039                            | -.195<sup>a</sup>                        | -.143                            | -.119                                    | -.135                            |
| R² for work block     | .054                             | .119                                      | .068                             | .186                                      | .082                             |
| Career grant awards   | .276<sup>a</sup>                 | .378<sup>a</sup>                         | .216<sup>a</sup>                 | .288<sup>a</sup>                          |                                  |
| R² for block          | .048                             | .091                                      | .030                             | .053                                      |                                  |
| Total R²              | .360                             | .503                                      | .412                             | .444                                      | .284                             |

<sup>a</sup> P<.01.
<sup>b</sup> P<.05.
<sup>c</sup> PT/DT/PT=physical therapy/transitional Doctor of Physical Therapy.
### Table 5.
Two-Year and Career Peer-Reviewed Publishing Rates (%) by Rank, Tenure-Related Status, and Disciplinary Type

| Appointment Status  | 2-Year Peer-Reviewed Article Publication |  | Career Peer-reviewed Article Publication |  |
|---------------------|-----------------------------------------|--|------------------------------------------|--|
|                     | None | 1-2 | 3-5 | ≥6  | None | 1-2 | 3-5 | ≥6  |
| Assistant professor |      |     |     |     |     |     |     |     |
| T/TT, a n=104       | 30.8 | 34.6| 19.3| 15.3| n=103| 19.4| 20.4| 19.4| 40.8|
| NTT/NTS, b n=109    | 51.4 | 32.2| 10.1| 6.3 | n=108| 35.2| 31.4| 10.1| 23.3|
| Associate professor |      |     |     |     |     |     |     |     |
| T/TT, n=123         | 22.8 | 42.3| 19.6| 15.3| n=121| 5.0 | 19.0| 21.4| 54.6|
| NTT/NTS, n=54       | 37.0 | 51.8| 9.3 | 1.9 | n=53 | 9.4 | 39.6| 20.8| 30.2|
| Professor           |      |     |     |     |     |     |     |     |
| T/TT, n=64          | 25.0 | 26.5| 32.9| 15.6| n=62 | 3.2 | 1.6 | 14.5| 80.7|
| NTT/NTS, n=11       | 18.2 | 45.5| 36.3| 0.0 | n=10 | 10.0| 20.0| 0.0 | 70.0|
| Disciplinary type   |      |     |     |     |     |     |     |     |
| Hard, n=168         | 21.5 | 36.6| 25.0| 16.9| n=168| 6.5 | 12.5| 18.1| 62.9|
| Soft, n=307         | 43.1 | 36.7| 13.8| 6.4 | n=307| 24.4| 28.0| 16.9| 30.7|

a Tenured or on tenure track.
b Non–tenure track or no tenure system.

### Table 6.
Characteristics of Faculty Holding Master’s and Doctoral Degrees (%)

| Characteristic                        | Master’s (n=128) | DPT a (n=37) | PhD (n=250) | EdD (n=46) | Other Doctorate (n=40) |
|---------------------------------------|------------------|--------------|-------------|------------|------------------------|
| Mean years of faculty experience      | 12.2             | 5.7          | 14.0        | 16.6       | 10.5                   |
| 2-year peer-reviewed article publications is equal to "none" | 58.3             | 59.5         | 19.2        | 37.0       | 27.5                   |
| 2-year peer-reviewed presentations is equal to "none" | 37.5             | 45.9         | 17.2        | 17.4       | 17.5                   |
| Prefer teaching                       | 75.8             | 63.6         | 46.8        | 56.5       | 70.0                   |
| Prefer research                       | 3.1              | 5.5          | 43.6        | 15.2       | 15.0                   |
| Prefer service                        | 17.2             | 21.8         | 6.0         | 23.9       | 12.5                   |
| Non-tenure track                      | 55.5             | 60.0         | 16.4        | 13.0       | 25.0                   |
| Tenure track                          | 10.9             | 18.2         | 32.4        | 30.4       | 27.5                   |
| Tenured                               | 19.5             | 3.6          | 42.4        | 43.5       | 30.0                   |
| No tenure system                      | 14.1             | 18.2         | 8.8         | 10.9       | 17.5                   |
| Scholarship of discovery              | 39.8             | 29.7         | 72.0        | 47.8       | 50.0                   |
| Scholarship of integration            | 28.1             | 32.4         | 29.2        | 34.8       | 32.5                   |
| Scholarship of application            | 48.4             | 37.8         | 40.0        | 45.7       | 45.0                   |
| Scholarship of teaching               | 39.1             | 54.1         | 22.4        | 34.8       | 32.5                   |

a DPT=Doctor of Physical Therapy.
faculty scholarship articulates value for the full range of scholarship, including discovery, integration, application, and teaching. Despite the broad view of CAPTE, physical therapist scholars work within the higher education culture that honors and rewards discovery more highly than other forms of scholarship. Thus, the generally nonparadigmatic physical therapy academy may be at a disadvantage within the academic workplace.

In addition, it is not clear whether the priorities for clinical research articulated by professional leadership are subject to desired attention or produced in desired volume. A driving force behind the call for physical therapist faculty scholarship is the need to develop a strong evidence base for clinical practice. This requires, among other things, a sufficient volume of studies addressing efficacy and effectiveness of clinical interventions—the scholarship of discovery. Furthermore, only a small proportion of the respondents considered the CRA in planning a research agenda. The PDS were even less likely than the NPDS to tailor research activities to the CRA (Tab. 6). Perhaps the lack of attention to the CRA reflects limited exposure to the document. Perhaps it reflects tension between physical therapy and the discipline of highest degree. Although the second discipline may or may not result in a propensity toward scholarship of discovery, divided interests of faculty members may reduce the likelihood that physical therapist scholars will examine the clinical priorities of the profession in sufficient volume.

The multidisciplinary nature of the physical therapy academy is both a strength and a challenge for the physical therapy profession. The strength of the multidisciplinary faculty may be that it serves the wide array of interests and questions inherent in the nonparadigmatic field itself. Scholarship that addresses the needs of the diverse populations, clinical problems, and practice settings served by the field may require a diverse and multidisciplinary group of scholars.

On the other hand, the large proportion of participants who held degrees in soft fields appeared predisposed toward lesser and slower publishing productivity, more-limited grant support for scholarly work, and fewer and lesser rewards for accomplishments as faculty scholars. Scholars across the wide variety of fields represented may or may not hold mutual or complementary objectives related to physical therapy. The inclination and propensity among faculty members to communicate, collaborate, and produce scholarly works that contribute to the advancement of the profession’s science should be more closely examined.

The Changing Lives of Higher Education Faculty Are Reflected in Physical Therapy

Faced with public demand for accountability and cost containment, an evolving technology base, a rapidly expanding knowledge base, unprecedented fiscal constraints, and an increasingly diverse workforce, higher education institutions are seeking to increase their flexibility and responsiveness. For faculty, this means an increasing number of part-time, provisional, and non–tenure track appointments. These appointments may “unbundle” the faculty role by emphasizing just one element of the traditional teaching/research/service triad. The non–tenure track and contract appointments may offer some faculty members desirable opportunities to develop, market, and use intellectual talents in a flexible manner. However, some view such appointments as “second class,” with unclear expectations, limited rewards, lack of equity and power within faculty governance systems, and uncertain security.

With fully 43% of the participants reporting non–tenure track appointments (Tab. 1), it is apparent that

| Characteristic       | Discovery | Integration | Application | Teaching | Patient Care | Physical Therapy Education | Science | Other | N | Yes | No |
|----------------------|-----------|-------------|-------------|----------|--------------|-----------------------------|---------|-------|---|-----|----|
| Hard discipline      | 73.0      | 28.8        | 38.0        | 22.7     | 49.7         | 22.1                        | 63.2    | 3.1   | 158 | 21.5 | 78.5 |
| (n=163)              |           |             |             |          |              |                             |         |       |     |      |     |
| Soft discipline      | 48.4      | 28.9        | 45.6        | 35.5     | 62.4         | 40.4                        | 20.9    | 10.5  | 270 | 33.8 | 61.3 |
| (n=287)              |           |             |             |          |              |                             |         |       |     |      |     |

* Number is percentage of participants.
Predicting Productivity in Scholarship

physical therapist faculty are subject to national trends in faculty hiring. These non-tenure track appointments may allow physical therapist education programs flexibility in hiring and may offer some faculty members opportunities for flexibility and specialization in roles. However, the participants with non-tenure track appointments were more likely to be nonpublishers and less likely to be high-frequency publishers than the participants with tenure track appointments (Tab. 5). Given the terms of any individual non-tenure track appointment, a lower rate of publishing productivity might be quite acceptable at the institutional level. The physical therapist program accreditation standards require that every physical therapist faculty member demonstrate a consistent and ongoing record of scholarly productivity. Therefore, the non-tenure track appointments may be problematic for the profession. In addition, a disproportionate number of non-tenure track appointments may diminish the influence of the physical therapist programs within their institutions. Attention to hiring practices and evaluation of the accreditation criteria related to individual versus programmatic scholarship may be useful as the profession moves forward.

The DPT-Trained Faculty Cohort
The extent to which DPT-trained faculty are prepared to fulfill roles as scholars, particularly in the area of discovery, is a matter of ongoing discussion.48–52 Many authors49–52 suggest that DPT-trained faculty members are best prepared to teach and to engage in scholarships of integration, application, and teaching. The DPT-trained participants comprised only a small proportion (7.7%) of the study participants. They had an average of 5 years of experience as a faculty member. Based on their limited representation and experience, it is difficult to draw precise impressions of their work as scholars. However, they do allow initial consideration of the DPT-trained faculty cohort in relation to scholarly work.

It appears that DPT-trained faculty members were working differently than other doctorally trained faculty members (Tab. 7). The 2-year publication and presentation rates for DPT-trained faculty members were lower than for any other type of doctorally prepared faculty member. The DPT-trained faculty members were least likely of all doctorally prepared faculty members to prefer research to teaching or service. Approximately 78% of the DPT-trained faculty members were working without a tenure system or were not on a tenure track. The DPT-trained faculty members appear more similar to the master’s degree-prepared participants than to the other doctorally trained participants (Tab. 7).

The implications of the work patterns of this small cohort are not clear, but several thoughts bear consideration. First, some authors50,51 have suggested that clinical doctoral training should prepare the DPT-trained faculty member to engage in scholarly integration, application, and teaching, but not discovery. The results of our study suggest the DPT-trained faculty cohort is most active in nondiscovery scholarship. Second, the emphasis on teaching among DPT-trained individuals is consistent with suggestions that DPT-trained faculty members are best prepared to serve in teaching rather than research roles.50,51 The DPT-trained participants in our study appeared to at least prefer teaching to research. Third, even accounting for the early career stage of a large proportion of the DPT-trained participants, there was a high number of nonpublishers and nonpresenters during the 2-year period reported; higher than for any other type of doctorally trained participant. Persistently low performance in scholarship could jeopardize professional development and program standing. Fourth, a high proportion of DPT-trained participants held non-tenure track appointments, which may serve as a disincentive to productivity as a scholar.

Thus, it appears the DPT-trained faculty may be engaged in precisely the kinds of activities for which some authors suggest they are best prepared. The optimal composition of the physical therapy academy may well include a proportion of faculty with professional clinical degrees.55 What is not at all clear is whether an increase in the proportion of faculty prepared at the clinical doctoral level will enhance or compromise the profession’s research mission.50,52 The DPT-trained faculty cohort should be subject to ongoing study.

Limitations
Limitations to external validity of the survey include sampling error and a low response rate.39 The sampling frame consisted of 1,735 faculty members representing 188 out of 194 accredited programs. The 3.1% of programs and the similar proportion of faculty omitted from the sampling frame most likely resulted in little compromise to the representative nature of the sample. Careful development of a the survey instrument and 2 methods of follow-up with nonrespondents helped minimize nonresponse. The wave analysis indicated little likelihood of nonresponse bias.

Threats to internal validity included reporting inaccuracy.39 There were errors in reporting of institutional type, and corrections were made by checking individual responses. Other possibilities of systematic response error cannot be ruled out.

Directions for Future Study
This study did not include part-time faculty, nor did it explore the terms
of non-tenure track appointments. Future research should examine the circumstances, roles, and responsibilities of faculty with alternative appointments and the relationships of non-tenure track and part-time appointments to scholarly productivity. An additional line of inquiry is the relationship of professional standards for scholarly productivity to institutional missions and productivity standards, particularly in non-research institutions. Additional study should examine in greater detail the contributions of each disciplinary field to priorities of the profession. Such inquiry should distinguish among cohorts of academic and clinical doctorally trained individuals in order to contribute to the analysis of the DPT degree as an appropriate credential for faculty scholars.

Conclusion
This study is the first to examine factors associated with the scholarly productivity of individual faculty members in physical therapist education programs. Demographic, environmental, career, and work characteristics were included in a model by which productivity was analyzed. A national sample of physical therapist faculty members was surveyed using an instrument developed for the purposes of this study. Career factors generally predicted the largest proportion of variance in peer-reviewed article publications, peer-reviewed presentations, and grantsmanship. The study provides ample direction for future inquiry regarding the status of scholarship and of scholars in physical therapy.

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I applaud Kaufman for her attention to this important issue in this study\(^1\) and her 2005 treatise on scholarship.\(^2\) She has recognized a long-standing challenge that has been the topic of extensive conversation but little analysis in physical therapy.

The need to support faculty development and scholarship has been recognized in all disciplines in higher education, most consistently in clinical disciplines. Studies in medicine, nursing, clinical laboratory medicine, occupational therapy, and other disciplines have all documented low publication rates of faculty.\(^3\)–\(^7\) These studies also have investigated the barriers to faculty scholarship, agreeing on the obvious hurdles of time (teaching and clinical responsibility), research knowledge and experience (lack of research doctorates), and limited support (mentorship). These factors also have been shown to be related to the research mission of the institution, which influences resources and scholarship expectations. Kaufman has shown that, not surprisingly, physical therapy faculty are subject to these same constraints.

Kaufman adds an important consideration to this discussion, however, by postulating about the nature of our science and the "soft" focus of physical therapy research. Based on her 2005 thesis, she has cited an interesting model to help explain limitations of faculty research in physical therapy. The concept of "soft" and "hard" disciplines is helpful to appreciate varied research approaches in different fields. The author also points out a lack of a unifying theory in physical therapy, which is reflected in the diversity of concentrations for those who have advanced degrees. Unfortunately, the study does not include data on which fields of study faculty have pursued. If we accept that physical therapy is a soft discipline because of its diversity of content, then I would assume this is also true of other diverse clinical professions, such as nursing and medicine. Research in these fields can be equally eclectic in terms of focus. Therefore, studies in these disciplines should be useful for understanding our own scholarship struggles.

Kaufman comments that the non-paradigmatic nature of physical ther-