

## RESEARCH ARTICLES

### Relationship Between Admission Data and Pharmacy Student Involvement in Extracurricular Activities

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**Objectives.** To assess pharmacy student involvement in leadership and service roles and to evaluate the association between admissions data and student involvement.

**Methods.** Doctor of pharmacy (PharmD) students were invited to complete a 56-item online survey instrument containing questions regarding leadership and service involvement, work experiences, perceived contribution of involvement to skill development, and perceived importance of involvement. Responses were linked to admissions data to identify possible associations.

**Results.** Five hundred fourteen (82.4%) pharmacy students completed the survey instrument. Students with higher admissions application and interview scores were more likely to be involved in organizations and hold leadership roles, while students with higher admissions grade point averages were less likely to be involved in organizations and leadership roles.

**Conclusions.** Assessing students' involvement in leadership and service roles can assist in the evaluation of students' leadership skills and lead to modification of curricular and co-curricular activities to provide development opportunities. Student involvement in extracurricular activities may encourage future involvement in and commitment to the pharmacy profession.

**Keywords:** student leadership, academic performance, admission criteria

## INTRODUCTION

The Accreditation Council on Pharmacy Education (ACPE) requires pharmacy colleges and schools to implement an evaluation plan to assess curricular outcomes and effectiveness.<sup>1</sup> At Purdue University, the Assessment Committee formulated an evaluation plan that includes an examination of didactic and extracurricular experiences as well as academic performance to provide an overall student assessment. One component of the plan includes assessing student involvement in leadership and service roles.

The development of leadership skills can be an important component of professional education to provide foundational skills and abilities necessary for future leadership positions as a pharmacist. Transformational leadership is necessary to educate future leaders who can advocate change and assist in creating a patient-centered, outcomes-focused healthcare system.<sup>2,3</sup> Many pharmacy colleges and schools have developed student leadership courses, programs, and opportunities that can influence

student performance by providing an alternative setting to the classroom to apply leadership skills.

Colleges and schools of pharmacy are interested in understanding the factors that influence successful completion of pharmacy programs by analyzing students' academic credentials using admission data.<sup>4</sup> Students who earn a bachelor's degree prior to entering a pharmacy program have higher cumulative grade point averages (GPAs) during the first year of the PharmD program than other students<sup>5,6</sup>; however, the practical implications of a significant difference in GPA is questionable.<sup>6</sup> The association between student academic success and factors such as prepharmacy GPA, grades in specific prepharmacy courses, Pharmacy College Admission Test (PCAT) scores, and a prior 4-year college degree has been examined.<sup>4-11</sup> Cumulative prepharmacy GPA is an inconsistent predictor of academic success in pharmacy school.<sup>12-20</sup> Chisholm and colleagues reported a prior 4-year college degree as a predictor of success but the results of a study by Thomas and colleagues did not determine a prior degree as a predictor of success.<sup>8,9,16,21</sup> Results also have varied regarding whether Pharmacy College Admission Test (PCAT) composite and subscores predict academic success in pharmacy school.<sup>12,14-18,20-22</sup> While these studies examined factors predicting academic success at the time of admission, there

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is a lack of published literature examining factors predicting student involvement in extracurricular activities in pharmacy school.<sup>23</sup> The primary objectives of this study were to determine the extent of student involvement in leadership and service roles and to examine the relationship between admissions data and student involvement.

## **METHODS**

A 56-item survey instrument was developed based on findings/information from an extensive literature review in pharmacy, management, and education, as well as feedback from experts who pilot tested the survey instrument prior to distribution. Currently the college has no admission requirement for extracurricular service activities although encouraged. The survey instrument consisted of 3 sections: involvement in leadership, service roles, and work experiences; perceptions of the contribution of extracurricular activity to personal skill development (eg, oral communication, problem solving); and perceptions of the importance of involvement (eg, responsibility, influence).

The first section of the survey instrument consisted of 18 questions pertaining to student involvement in leadership and service roles (ie, pharmacy and nonpharmacy university/college organizations, community service/volunteerism activities) and work experience (ie, pharmacy and nonpharmacy, length of experience) since beginning the PharmD program. Students were asked to specify the number of organizational memberships and leadership roles, the number of months and type of work experience, and their level of involvement in extracurricular activities.

The second section consisted of 16 questions pertaining to students' perceptions of the contribution that extracurricular activities make in developing the personal skills necessary for future employment as pharmacists. The items included oral communication, problem solving, and organization of projects. A 4-point Likert scale (1 = insignificant to 4 = significant) was used to assess students' perceptions of contribution to skill development.

The third section of the survey instrument included 18 questions designed to measure students' perceived level of importance for participation in extracurricular activities (eg, responsibility, influence, challenge). Responses were rated using a 4-point Likert scale (1 = not important to 4 = very important). The study protocol and instrument received approval by the Purdue University Institutional Review Board.

In the 2010 spring semester, an invitation to complete an online survey instrument was distributed to all PharmD students. Students were asked to indicate their involvement in extracurricular activities since beginning their first year of pharmacy school and to exclude extra-

curricular activities prior to entering the professional program. Completion of the survey instrument was a requirement for first- and second-year students (their responses were included in their professional portfolio) but participation was optional for third- and fourth-year students. One e-mail reminder was sent to all students to maximize survey participation.

Data from the survey instruments were compared with admissions data to identify any relationships between student involvement in extracurricular activities and variables such as campus of origin (college or university last attended), initial GPA, application score, interview score, total admission score, and whether the student had earned a prior degree. The application score, interview score, total admission score were determined by faculty members prior to admission. The maximum score possible for each was 30 points. The student total admission score was the sum of the initial prepharmacy GPA (multiplied by 10), the application score, and the interview score for a possible 100 points.

The application score was based on scores in the following categories: quality of written essay, demonstrated leadership, community service, work experience, and pharmacy career path exploration. The interview score did not include points for leadership and service specifically but did address areas such as: (1) teamwork and dealing with conflict, (2) interpersonal skills, (3) time management/life balance, (4) explanation of ideas, (5) approach to learning and intellectual curiosity, and (6) integrity, empathy, and knowledge about and passion for pharmacy.

All data were analyzed using SPSS version 17.0 (SPSS Inc., Chicago, Illinois). An *a priori* level of 0.05 was used for significance. Descriptive statistics were calculated for involvement in organizations, leadership roles, length of employment, and student admission data, as well as for student perceptions of how these activities contributed to personal skill development and the importance of participation. Higher scores signified more involvement in an extracurricular activity. The Shapiro-Wilk test was used to determine whether the data were normally distributed. Pearson correlation coefficients were calculated to examine the relationship between student admission data and involvement in extracurricular activities. Multiple regression and analysis of variance (ANOVA) was used for comparisons among student admission data and extracurricular activities to determine their effects on student involvement. Tukey's multiple comparisons were used to evaluate between-group differences.

## **RESULTS**

Approximately 160 students comprise each year of the PharmD program at Purdue University. Of the 624

students enrolled, 514 responses (82.4% response rate) were collected during the spring semester of the 2010 academic year. Some survey items were not completed by all students; therefore, not all statistical tests included 514 students (ie, the total number of respondents) in the analysis.

Of the 514 respondents, 72.5% (n = 372) had completed their prepharmacy education at Purdue University, West Lafayette campus, and 10.9% (n = 56) had received a prior degree (Table 1). The average scores for the application and interview were  $26.8 \pm 1.7$  and  $25.4 \pm 2.6$ , respectively, of a possible 30 points maximum. The student average GPA from admission data was  $3.7 \pm 0.3$  on a 4-point scale. Forty students (7.8 %) had a total score of 95 or greater, which reflected a high GPA and high application and interview scores.

Thirty-six percent of students (N = 185) had non-pharmacy work experience, which included all work experience that was not completed in a pharmacy (Table 2). Four hundred three students (78.4%) reported nonacademic pharmacy work experience. Nonacademic pharmacy work experience excluded pharmacy experience associated with school requirements (eg, introductory pharmacy practice experiences). Of the students reporting nonacademic pharmacy work experience, 333 (64.8%) had experience in a chain retail pharmacy.

Students were asked to report their involvement as members and leaders in any organizations (Table 2 and Table 3). Leadership roles were not defined or limited to

Table 1. Pharmacy Students Who Participated in a Study to Determine the Relationship Between Admission Data and Involvement in Extracurricular Activities (N = 514)

Variable	
Campus of origin, No. (%)	
West Lafayette	372 (72.5)
Partner school <sup>a</sup>	108 (21.1)
Out of state	33 (6.4)
Prior degree, No. (%)	
Yes	56 (10.9)
No	458 (89.1)
Application score, Mean (SD) <sup>b</sup>	26.77 (1.7)
Interview score, Mean (SD) <sup>b</sup>	25.40 (2.6)
Total score, Mean (SD) <sup>c</sup>	88.34 (6.4)
Grade point average at time of interview, Mean (SD) <sup>d</sup>	3.66 (0.3)

<sup>a</sup> Schools/colleges that have an approved plan of prepharmacy study on file with Purdue.

<sup>b</sup> Maximum score = 30 points.

<sup>c</sup> Total score = application score + interview score + (interview GPA x 10). Maximum score = 100 points.

<sup>d</sup> Grade point average on 4.0 scale.

Table 2. Involvement and Leadership Demographics of Pharmacy Students Who Participated in a Study to Determine the Relationship Between Admission Data and Involvement in Extracurricular Activities (N = 514)

Variables	No. (%)
Non-pharmacy work experience	
Yes	185 (35.9)
No	329 (64.1)
Non-academic pharmacy work experience	
No	111 (21.6)
Yes	403 (78.4)
Type of pharmacy (N = 403) <sup>a</sup>	
Chain	333 (64.8)
Independent	58 (11.3)
Hospital	106 (20.6)
Other	63 (12.3)
None	3 (0.6)
Number of pharmacy organizations memberships	
None	135 (26.3)
1	132 (25.7)
2	132 (25.7)
3	78 (20.6)
4	22 (15.2)
5	8 (1.6)
6	7 (1.4)
Number of pharmacy organization leadership roles	
None	196 (38.1)
1	211 (41.1)
2	57 (11.1)
3	26 (5.1)
4	11 (2.1)
5	6 (1.2)
6	7 (1.4)
Number of non-pharmacy university/college organizations memberships	
None	209 (40.7)
1	157 (30.5)
2	83 (27.2)
3	37 (16.1)
4	14 (2.7)
5	5 (1.0)
6	9 (1.8)
Number of non-pharmacy university/college organization leadership roles	
None	242 (47.1)
1	154 (30.0)
2	68 (13.2)

(Continued)

Table 2. (Continued)

Variables	No. (%)
3	25 (4.9)
4	15 (2.9)
5	2 (0.4)
6	8 (1.6)
Number of community service/volunteerism activities	
None	176 (34.2)
1	112 (21.8)
2	98 (19.1)
3	50 (9.7)
4	25 (4.9)
5	8 (1.6)
6	45 (8.8)
Extent of involvement in extracurricular activities (N = 510)	
Very Involved (more than 7 hours per week)	81 (15.9)
Somewhat Involved (2 to 7 hours per week)	179 (34.8)
Not Too Involved (1 to 2 hours per week)	152 (29.6)
Not at All Involved (less than 1 hour per week)	98 (19.1)
Amount of involvement in extracurricular activities if given the opportunity (N = 510)	
Same Involvement	173 (33.9)
More Involvement	327 (64.1)
Less Involvement	10 (2.0)

<sup>a</sup> Multiple responses possible

traditional roles (eg, president, vice president) to allow students to define the term according to their own personal context. Approximately 74% of students (n = 379) had been involved with a pharmacy organization. Of those involved, 51.4% (n = 264) had been involved in 1 or 2 organizations and 268 students (52%) had held between 1 and 2 leadership roles. Approximately 60% (n = 305) had been involved in nonpharmacy university/college organizations. Of the students involved in university/college organizations, 240 (46.7%) were involved in 1 to 2 organizations and 222 students (43.2 %) had held between 1 and 2 leadership roles.

For questions regarding student involvement in community service and volunteerism activities, 66.3% (n = 338) had been involved in a community service or volunteerism activity since the beginning of their first year, with the majority (62.1 %) involved in 1 or 2 activities. Fifty-one percent (n = 260) of students reported involvement of more than 2 hours per week in extracurricular activities,

and 98% of students (n = 500) planned to continue their current level of involvement or become more involved in extracurricular activities.

Student perceptions were obtained regarding the contribution of extracurricular activities to their personal skill development. The 5 personal skills that received the lowest average scores were budgeting finances ( $2.30 \pm 1.02$ ), written communication ( $2.4 \pm 0.9$ ), using knowledge to advise policy ( $2.4 \pm 1.0$ ), performing technical tasks ( $2.6 \pm 0.9$ ), and developing personal values ( $2.9 \pm 1.0$ ). The 5 personal skills that received the highest average scores were taking responsibility ( $3.4 \pm 0.8$ ), helping others ( $3.3 \pm 0.8$ ), getting along with others ( $3.3 \pm 0.9$ ), organizing work and projects ( $3.2 \pm 0.9$ ), and understanding others' point of view ( $3.2 \pm 0.8$ ).

Student perceptions also were obtained regarding level of importance for involvement in extracurricular activities. The 5 lowest average scores were reported for receiving recognition ( $2.2 \pm 1.0$ ), obligation ( $2.4 \pm 1.0$ ), receiving feedback ( $2.6 \pm 1.0$ ), preference to work with others ( $2.7 \pm 1.0$ ), and influencing others ( $2.7 \pm 1.0$ ). The 5 highest average scores were reported for liked helping people ( $3.4 \pm 0.7$ ), associating with others ( $3.3 \pm 0.7$ ), learning new things ( $3.3 \pm 0.8$ ), gaining experience/skills for future employment ( $3.3 \pm 0.9$ ), and expressing care/concern ( $3.2 \pm 0.8$ ).

The second objective of the study was to evaluate the association between admissions data and student involvement. Multiple regression was used to analyze admission variables against each other and with student involvement. Involvement questions were analyzed against current GPA and admission variables which included: campus of origin, initial GPA at time of interview (prepharmacy GPA), prior degree, application score, interview score, and a total score (combination of the application score, interview score, and the initial GPA). Average current GPA was  $3.5 \pm 0.3$ . When all admission variables were entered into the model using current GPA as the dependent variable, campus of origin, initial GPA at time of interview, and the attainment of a prior degree explained 45.2% of the variation of the current GPA ( $p < 0.0001$ ). Students with a West Lafayette campus of origin were more likely to have a higher initial current GPA than students with another campus of origin. Additionally, students who had earned a prior degree were more likely to have a higher current GPA than students who had not.

Multiple regression analyses also were performed to determine significant associations between admission variables and student extracurricular involvement (Table 4). The student total admission score was the sum of the initial GPA (multiplied by 10), the application score, and the interview score, with a possible total of 100 points.



Table 3. Student Extracurricular Involvement by Year in Pharmacy School (N = 514), No. (%)

Involvement Variable	First-Year Pharmacy Students (n = 158)	Second-Year Pharmacy Students (n = 145)	Third-Year Pharmacy Students (n = 104)	Fourth-Year Pharmacy Student (n = 107)	Total
Pharmacy organization memberships (N = 379)					
1	66 (59.5)	34 (33.7)	18 (22.0)	14 (16.5)	132 (34.8)
2	39 (35.1)	40 (39.6)	25 (30.5)	28 (32.9)	132 (34.8)
3	6 (5.4)	19 (18.8)	23 (28.0)	30 (35.3)	78 (20.6)
4	0	6 (5.9)	8 (9.8)	8 (9.4)	22 (5.8)
5	0	1 (1.0)	7 (8.5)	0	8 (2.1)
6	0	1 (1.0)	1 (1.2)	5 (5.9)	7 (1.8)
Pharmacy organization leadership roles (N = 379)					
1	74 (89.2)	69 (74.2)	35 (48.6)	33 (47.1)	211 (66.4)
2	9 (10.8)	16 (17.2)	14 (19.4)	18 (25.7)	57 (17.9)
3	0	3 (3.2)	8 (11.1)	15 (21.4)	26 (8.2)
4	0	3 (3.2)	6 (8.3)	2 (2.9)	11 (3.5)
5	0	0	6 (8.3)	0	6 (1.9)
6	0	2 (2.2)	3 (4.2)	2 (2.9)	7 (2.2)
University/college organization memberships (N = 308)					
1	66 (64.1)	36 (45.6)	25 (41.0)	30 (48.4)	157 (51.5)
2	26 (25.2)	24 (30.4)	21 (34.4)	12 (19.4)	83 (27.2)
3	5 (4.9)	12 (15.2)	7 (11.5)	13 (21.0)	37 (12.1)
4	3 (2.9)	5 (6.3)	2 (3.3)	4 (6.5)	14 (4.6)
5	2 (1.9)	0	1 (1.6)	2 (3.2)	5 (1.6)
6	1 (1.0)	2 (2.5)	5 (8.2)	1 (1.6)	9 (3.0)
University/college organization leadership roles (N = 308)					
1	65 (69.1)	35 (49.3)	26 (47.3)	28 (53.8)	154 (56.6)
2	22 (23.4)	21 (29.6)	13 (23.6)	12 (23.1)	68 (25.0)
3	5 (5.3)	10 (14.1)	3 (5.5)	7 (13.5)	25 (9.2)
4	2 (2.1)	2 (2.8)	7 (12.7)	4 (7.7)	15 (5.5)
5	0	1 (1.4)	1 (1.8)	0	2 (0.7)
6	0	2 (2.8)	5 (9.1)	1 (1.9)	8 (2.9)
Number of community service/volunteerism activities (N = 338)					
1	37 (41.6)	36 (35.0)	19 (25.7)	20 (27.8)	112 (33.1)
2	23(25.8)	29 (28.2)	23 (31.1)	23 (31.9)	98 (29.0)
3	11 (12.4)	15 (14.6)	14 (18.9)	10 (13.9)	50 (14.8)
4	7 (7.9)	7 (6.8)	4 (5.4)	7 (9.7)	25 (7.4)
5	4 (4.5)	2 (1.9)	2 (2.7)	0	8 (2.4)
6	7 (7.9)	14 (13.6)	12 (16.2)	12 (16.7)	45 (13.3)

Results from regression analyses showed that as total score increased, students were less likely to be involved in pharmacy and college/university organizations and leadership roles. Results from between-group analyses showed students with lower application and interview scores were more likely to have nonacademic work expe-

rience than students who did not. For involvement in pharmacy student organizations, third- and fourth-year students were more likely to be involved in pharmacy student organizations than first- or second-year students ( $p = 0.038$ ). Students with higher application and interview scores were less likely to be involved in community

Table 4. Admission Variables Significantly Associated With Pharmacy Student Involvement in Extracurricular Activities

Variable	Beta	Standard Error	<i>P</i> <sup>b</sup>
Non-academic work experience			<0.001
Campus of origin <sup>a</sup>	0.10	0.04	0.020
Application score	-0.18	0.02	<0.001
Interview score	-1.47	0.19	<0.001
Total score	0.15	0.02	<0.001
Number of pharmacy student organization memberships			<0.001
Application score	0.47	0.07	<0.001
Interview score	4.41	0.60	<0.001
Total score	-0.44	0.06	<0.001
Number of pharmacy student organization leadership roles			<0.001
Campus of origin <sup>a</sup>	-0.37	0.15	0.011
Application score	3.97	0.69	<0.001
Interview score	0.48	0.08	<0.001
Total score	-0.40	0.07	<0.001
Involvement in university/college organizations			<0.001
Campus	0.36	0.05	<0.001
Prior degree	0.16	0.07	0.015
Number of university/college organization memberships		0.003	
Interview score	1.97	0.71	0.006
Application score	0.22	0.09	0.012
Total score	-0.19	0.07	0.008
Number of university/college organizations leadership roles			<0.001
Campus of origin <sup>a</sup>	-0.60	0.22	0.007
Application score	0.32	0.09	<0.001
Interview score	2.88	0.72	<0.001
Total score	-0.28	0.07	<0.001
Involvement in community service/volunteerism			0.001
Campus of origin <sup>a</sup>	0.13	0.05	0.012
Application score	-0.07	0.03	0.012
Interview score	-0.73	0.23	0.001
Total score	0.07	0.02	0.002

<sup>a</sup> Purdue main campus = 0; relationship school = 1; out-of-state = 2

<sup>b</sup> P significant if < 0.05.

service/volunteerism activities compared to students with lower scores.

Second-year students held more pharmacy student memberships than first-year students, while third- and fourth-year students held more memberships than second-year students. Students with a Purdue West Lafayette campus of origin had a greater likelihood to hold more pharmacy leadership roles compared to students with another campus of origin ( $p < 0.0001$ ). For involvement in nonpharmacy university/college organizations, students without a prior bachelor's degree and a Purdue West Lafayette campus of origin were less involved than those with a bachelor's degree from another college or university campus of origin ( $p < 0.0001$ ). Students from Purdue West Lafayette were less likely to be involved in community service/volunteerism activities compared to students from other colleges and universities ( $p = 0.013$ ).

However, when students were asked to rate their overall involvement, students from Purdue West Lafayette were more likely to state they would be very to somewhat involved in extracurricular activities than students with a different campus of origin ( $p < 0.0001$ ). Students from Purdue West Lafayette also were more likely to indicate that they wanted the same or more involvement in extracurricular activities than students from other colleges and universities ( $p = 0.014$ ).

## DISCUSSION

The first objective of this study was to determine student involvement in leadership/service roles. The majority of students reported nonacademic pharmacy work experience primarily in chain retail pharmacy, involvement in at least 1 pharmacy and 1 nonpharmacy university/college organization, involvement in a community service

or volunteerism activity, and held at least 1 organizational leadership role. In a study by Renzi and colleagues, approximately 30% of students held at least 1 leadership position in a professional or social organization.<sup>4</sup> In this study, 61.9% had a leadership role in at least 1 pharmacy organization and 52.9% in at least 1 nonpharmacy organization, which is much higher than the rate reported by Renzi and colleagues. This finding could be the result of allowing students to determine a personal definition of a leadership role rather than predefining a leadership role. These definitions allowed a broader context of leadership and included roles such as chairing committees and organizing events without the inclusion of a formal leadership title.

Floerchinger evaluated numerous articles regarding student perceptions of the benefits of involvement in extracurricular activities, which are: improved interpersonal skills including communication and group organizational skills; a positive influence on skills in leadership, communication, teamwork, organizing, decision-making and planning; greater overall satisfaction with their college experience compared with less involved students; useful experience in obtaining a job and providing job-related skills; and development of lifelong values of volunteerism and services.<sup>24</sup> In another study, researchers analyzed the influence of student leadership positions on the lives of students up to 30 years after graduation.<sup>25</sup> The results suggested that prior student leadership experience positively influenced future organizational involvement. In that study, over 50% of undergraduate students held at least 1 leadership role in an organization and perceived the opportunity to work with others while helping people, learning new things, and gaining skills for future employment as important reasons for their involvement in extracurricular activities. Involvement in extracurricular activities may have provided students with additional opportunities to further improve skills necessary for future employment and assist in the development of a lifelong commitment to the pharmacy profession.

The second objective of this study was to examine the relationship between admissions data and student involvement. Students with lower application and interview scores were more likely to have nonacademic pharmacy work experience compared to students who had higher scores. These students may have felt that pharmacy work experience could provide them with information and background about the pharmacy profession as well as increasing their likelihood of acceptance into the pharmacy program. However, this experience may have come at the expense of developing a well-rounded experience and interpersonal skills related to the interview process.

Students in different years of the PharmD program varied significantly with regard to involvement. Third-

and fourth-year students were more likely to be involved in pharmacy student organizations than first- or second-year students. Second year students held more pharmacy student memberships than first-year students, while third- and fourth-year students held more memberships than second-year students. These results could be due to the increased length of time third- and fourth-year students had been in the program at the university, which may have increased their opportunities for involvement. Also, students who were more involved in activities may have been more likely to complete the survey instrument than those less involved, as the survey was voluntary for third- and fourth-year students.

There were significant differences with regard to involvement depending on the students' campus of origin. Students who completed their prepharmacy studies at the Purdue West Lafayette campus were very to somewhat involved in extracurricular activities compared to students from other colleges/universities. These students were more likely to have held more leadership roles compared to other students. Results could be due to the students having greater familiarity with the campus, which allowed them to become more involved. These students also may have had more time and opportunities to join organizations due to potential involvement in prepharmacy years. Students who attended prepharmacy school at the Purdue West Lafayette campus were less likely to be involved in community service/volunteerism activities compared to students from other colleges/universities. These results could be due to students being more involved in campus organizations and leadership roles leading to less involvement in community service activities. Because many organizations participate in community projects, these students may not consider these activities as community service/volunteerism but rather part of organizational involvement. Fourth-year students were more likely than first-year students to be involved in leadership roles and organizations, probably because students who were more involved in activities completed the survey instrument. To improve extracurricular involvement, an orientation program could be developed to introduce all incoming professional students to various opportunities available through organizations and activities. Potential activities could include seminars, training sessions, or additional courses to allow student development of leadership skills. Additional leadership positions could be created to increase the number of students able to attain a leadership role. By increasing exposure to and knowledge of opportunities for involvement, students may become more involved in extracurricular activities, which could support future involvement and commitment to the pharmacy profession.

Results from regression analyses showed that as total admission score increased, students were less likely to be involved in pharmacy and college/university organizations and leadership roles. Because students with higher application and interview scores were more likely to hold organizational memberships and leadership roles and students with a higher total score had lower involvement, initial GPA affected overall involvement by affecting the total admission score. Because the total score was the sum of the application and interview scores as well as the initial GPA multiplied by a factor of 10, students with a higher GPA were more likely to have less organizational involvement. Therefore student organizational involvement decreased as prepharmacy GPA increased. The effect on GPA may be the result of active involvement in organizations as well as leadership positions. Due to the rigorous requirements of the professional program as well as the potential difficulty of increasing overall GPA, students may feel compelled to become involved in organizations to compensate for a lower GPA. A higher GPA also may be the result of extra effort placed on their studies, limiting the time available to participate in extracurricular activities.

There are several areas of the study that could limit the interpretation of the results. The survey was a portfolio requirement for first- and second-year students. Because fewer students in the third and fourth years completed the survey instrument, results could be influenced by selection bias as students who were more involved may have been more likely to respond. Because leadership roles were self-defined, students may have included roles that some would not consider leadership. However, by allowing students to define the leadership role, additional data on student leadership may have been captured that otherwise would have been unreported. Because it was linked to admissions data, student information was not de-identified. Students may have answered how they thought they should respond instead of honestly responding, resulting in social desirability bias. Because of these potential limitations, the study results cannot be generalized to other student populations beyond Purdue University. However, results could be useful to colleges and universities with similar student populations.

A postgraduation survey could be administered to alumni 5 to 10 years after graduation to assess their level of involvement as students in the professional program, current employment, and current level of involvement (eg, professional organization membership, leadership activities, outreach activities, community service). The postgraduation survey could provide further information regarding involvement in the pharmacy profession.

Another area of research could include the assessment of involvement in extracurricular activities with

more emphasis placed on application and interview scores vs. GPA. Factors such as attitude and self-efficacy could provide insight on student involvement and engagement during the PharmD program and after graduation.

## CONCLUSIONS

Student leadership will continue to be a topic of discussion in colleges and schools of pharmacy given the importance of mentoring future generations of pharmacy leaders and encouraging student involvement in the profession. This study found that students with higher admissions application and interview scores were more likely to be involved in organizations and hold leadership roles, while students with higher admissions grade point averages were less likely to be involved in organizations and leadership roles. The development of student leadership skills requires time and the opportunity to assume leadership roles. While there are assessments for evaluating other indicators of student success in pharmacy programs, admissions credentials or student demographics have not been evaluated with respect to their predictive value for student involvement and leadership. Results of this study could help in assessing student involvement in leadership and service roles.

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