RESEARCH

Longitudinal Measurement of Empathy in Student Pharmacists

Paul C. Walker, PharmD, Vincent D. Marshall, MS, Burgunda V. Sweet, PharmD, Sarah E. Vordenberg, PharmD, MPH

The University of Michigan, College of Pharmacy, Ann Arbor, Michigan
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Objective. To assess empathy longitudinally in student pharmacists and describe how it changes during their four years of pharmacy education.

Methods. The Jefferson Scale of Empathy Health Professions Student version (JSE-HPS) was completed by a cohort of student pharmacists at the beginning and end of their first year of pharmacy school (P1), then at the end of their second, third, and fourth years of pharmacy school (P2, P3, P4). Demographic data and information about students’ previous pharmacy work experience and experience interacting with patients were also collected.

Results. Student pharmacists’ empathy scores were relatively high at the beginning of P1, comparable to scores reported for medical and other health professions students. Empathy scores declined over the first two years of the pharmacy curriculum but increased during both P3 and P4, recovering to the level observed at the beginning of P1. Factor analysis identified three factors, namely “perspective taking,” “compassionate care,” and “walking in a patient’s shoes” that accounted for 26%, 19%, and 7% of the variance, respectively, and supported the construct validity of the JSE-HPS.

Conclusion. Student pharmacists’ empathy decreased during the early, primarily didactic years of the pharmacy curriculum but increased during the latter years that emphasize clinical experiences.

Keywords: assessment, empathy, pharmacy, student pharmacists

INTRODUCTION

Empathy is integral to the therapeutic relationship between health care providers and patients. Empathic engagement with patients leads to more accurate diagnoses; improved adherence with health care recommendations and clinical outcomes; reduced patient anxiety, depression, and hostility; and increased patient satisfaction with their care.1-9 Thus, empathy is an important skill pharmacists must have as they increasingly engage in therapeutic relationships with patients.10 However, no consensus definition exists for empathy, which complicates how it is taught and measured. The Jefferson Scale of Empathy (JSE), specifically designed for health care education, is based on the definition of empathy as, “A predominantly cognitive (as opposed to an affective) attribute that involves understanding (rather than feeling) of a patient’s concerns, experiences, pain, and suffering combined with a capacity to communicate this understanding and an intention to help.”12,13 Versions of the JSE are available for use with medical students (JSE-S) and students of other health care disciplines (JSE-HPS), including student pharmacists.14,15

The JSE is the most well-studied and widely used instrument for assessing empathy in medical education.16-18 It has been used to establish normative data and cutoff JSE-S scores for US medical students, which may be useful in identifying high- and low-scoring students and students who may need to improve their empathy skills.19-20 Studies using versions of the JSE to describe empathy development in students matriculating through medical school and other health professions schools report relatively high empathy scores in medical, nursing, and dental learners early in their professional education, with scores declining significantly over time, especially during the clinical learning experiences in students’ final years of training.21-33

Empathy development in students within a Doctor of Pharmacy (PharmD) program may follow a similar pattern; however, specific longitudinal evidence is lacking. The available evidence consists of cross-sectional studies that assess empathy across cohorts of student pharmacists by year of study or that evaluate changes in empathy following single, short-term empathy-enhancing interventions.34-36 Measuring empathy as an educational outcome
and understanding how it changes over the course of the curriculum may inform curricular changes to help students enhance their empathy skills. We describe using the JSP-HPS in a single cohort of student pharmacists during their four years of pharmacy education. The study objectives were to assess empathy longitudinally in a cohort of student pharmacists and to identify whether empathy scores evolved over time in a pattern similar to that seen in other health care provider students.

METHODS

The Doctor of Pharmacy program at our institution is a four-year curriculum. The first three years of the curriculum are primarily didactic; the last year is experiential. Empathy is taught as a communication skill in the first semester of pharmacy year one (P1). Students also engage in standardized patient interactions throughout the first three years of the curriculum: They receive 16 interactions in P1, five in pharmacy year two (P2), and five in pharmacy year three (P3). Students also practice empathy during introductory pharmacy practice experiences (IPPEs) in the community and health-system settings during P2 and P3, respectively. In IPPEs, empathy is assessed as a component of professional and ethical behavior, not as a separate criterion.

The JSE-HPS is a 20-item questionnaire that assesses cognitive empathy. Scores range from 20 to 140; higher scores indicate a more empathic orientation. The JSE-HPS was administered to a single cohort of student pharmacists (class of 2019) during their enrollment in the Doctor of Pharmacy program. Students were invited to complete the questionnaire as an online survey (Qualtrics, Qualtrics International Inc) at the beginning of P1 (baseline) and at the end of P1 after their introduction to the concept of empathy in the didactic curriculum but before completing any IPPEs. The JSE-HPS was then completed at the end of P2, P3, and pharmacy year four (P4). A link to the survey was emailed to students. During P1, P2, and P3, students completed the survey as a self-assessment during a class session; however, they were given the option to opt out of having their data used for research purposes. The JSE-HPS was administered during P4 as part of the end-of-year exit surveys. Gender, age, and information about students’ previous pharmacy work experience and experience interacting with patients were also collected. Survey data were deidentified prior to analysis to protect confidentiality. The study was given exempt status by the institutional review board at the University of Michigan.

Baseline characteristics including gender, age group in years, prior work in a pharmacy, and prior contact with patients were summarized using counts and percentages. Empathy scores were generated by scoring the JSE-HPS using the algorithm provided by Thomas Jefferson University. The JSE-HPS mean scores for groups within each baseline characteristic were compared using a one-way analysis of variance (ANOVA) if there were three or more groups; they were compared using a t test for independent samples if there were two groups. Mean JSE-HPS scores at each data collection point (start of P1 and ends of P1, P2, P3, and P4) were also compared using ANOVA. Data distributions for each group were summarized by using the measures of means, medians, skewness, and kurtosis.

To validate the internal structure of the JSE-HPS, an exploratory factor analysis was performed. The Kaiser criterion, specifying that only factors with an eigenvalue greater than one should be included, was used to determine the number of factors. To determine whether the data were fit for a factor analysis, the Bartlett test of sphericity and the Kaiser-Meyer-Olkin (KMO) statistic were performed; the Kaiser categorization of the KMO statistic was also considered. After determining an appropriate factor analysis model, we ascertained its model goodness of fit with a confirmatory factor analysis. The reliability, a measure of construct validity of the model, was examined using the algebraic greatest lower bound (GLB) method. The GLB was used instead of Cronbach alpha because of the multidimensional aspect of the JSE scores, and instead of coefficient omega because of the skewness in the JSE component variable distributions. To evaluate changes in students’ empathy scores year by year, we used a linear mixed model with random intercepts for each participant’s data. Adding the random intercepts allowed for estimating the correlation between a person’s repeated observations. The Tukey honest significant difference (HSD) test was used to correct for multiple comparisons.

All analyses were performed with R, version 4.0.4 (The R Foundation for Statistical Computing), using the REdaS package for the Bartlett sphericity and KMO statistics, the RCSDP package for the algebraic greatest lower bound, and the lavaan package for the confirmatory factor analysis.

RESULTS

All 85 P1 students in the class of 2019 were invited to participate; the JSE-HPS was completed by 82 (96%) students at the beginning of P1. Student demographic characteristics at baseline (beginning of P1) are shown in Table 1. Most students were female; students who did not specify their gender were excluded from all gender comparisons but were otherwise included in the analyses. Most students (62.2%) were 22 to 24 years of age and had pharmacy work
experience or experience interacting with patients prior to entering pharmacy school.

The number of students who completed the JSE-HPS at the ends of P1, P2, P3, and P4 are shown in Table 2. The mean empathy score (SD) at baseline was 111.5 (10.5); empathy scores were higher for male students than female students, although the difference was not significant (Table 1). There was no significant effect of age, previous pharmacy experience, or previous experience interacting with patients on baseline empathy scores.

Summary statistics of the empathy score distributions by year and gender are shown in Table 2. The JSE-HPS score distributions for the cohort were negatively skewed, but the effect on the distributions was not significant. Skewness measures the asymmetry of a probability distribution, where the skewness of a normal distribution is zero. A positive skewness corresponds to a long tail to the right with the peak of the score distribution tending to occur on the left of the distribution; a negative skewness corresponds to a long tail to the left with the peak of the score distribution tending to occur on the right of the distribution. A distribution is approximately symmetric if skewness is between $-0.5$ and $0.5$. Analysis of the distributions showed that the skewness of the overall and yearly data was negative.

Kurtosis, which is related to the tails of the distribution relative to that of the normal distribution, is a measure of the outliers present in a distribution. The normal (Gaussian) distribution has a kurtosis of 3. Values less than 3 correspond to a distribution having fewer outliers and values greater than 3 correspond to a distribution with more outliers. Values between $-2$ and $+2$ are considered acceptable to prove normal distribution of the data. The kurtosis of 3.03 in the overall set reveals the data to be mesokurtic; distributions of individual years had kurtosis values greater or less than three. The algebraic greatest lower bound reliability scores were all greater than .90, indicating a good level of internal consistency within and across the years of the study.

Over the first two years of the pharmacy curriculum, mean empathy scores declined (Table 3). No significant differences were found between scores at baseline and the end of P1 or between scores at the end of P1 and the end of P2. However, the difference in scores between baseline and the end of P2 was significant ($p = .034$). Scores at the end of P3 were higher than scores at the end of P1, although the difference did not reach statistical significance ($p = .054$). Scores were significantly higher at the end of P3 compared to end of P2 ($p = .003$) and were significantly higher at the end of P4 compared to both the end

| Table 1. Student Characteristics and Baseline Mean Scores on the Jefferson Scale of Empathy Health Professions Student Version |
| N=82 (%) | JSE-HPS score mean (SD) | $p$ value |
|----------|------------------------|----------|
| All students | 111.5 (10.5) | .650$^a$ |
| Gender | | |
| Female | 49 (60%) | 110.7 (10.9) |
| Male | 30 (37%) | 112.9 (10.0) |
| Not specified | 3 (4%) | 112.7 (12.6) |
| What is your age in years? | | .364$^a$ |
| 19-21 years | 16 (20%) | 110.5 (10.2) |
| 22-24 years | 51 (62%) | 113.0 (11.0) |
| 25-27 years | 7 (9%) | 105.4 (8.1) |
| 28-30 years | 5 (6%) | 111.6 (9.6) |
| 31-51 years | 3 (4%) | 106.0 (7.5) |
| Have you worked in a pharmacy in the past? | | .380$^b$ |
| No | 31 (38%) | 110.1 (12.4) |
| Yes | 51 (62%) | 112.4 (9.3) |
| Have you had any patient interactions in the past? | | .245$^b$ |
| No | 13 (16%) | 114.9 (11.1) |
| Yes | 69 (84%) | 110.9 (10.4) |

Abbreviations: JSE-HPS=Jefferson Scale of Empathy Health Professions Student version.

$^a$ one-way ANOVA
$^b$ t test for independent samples

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of P1 ($p=.012$) and the end of P2 ($p<.001$). Scores at the end of P4 were not significantly different from scores at baseline or the end of P3.

Three factors with eigenvalues greater than one, namely those called “perspective taking,” “compassionate care,” and “walking in a patient’s shoes” were identified. The eigenvalues of these factors were 4.42, 3.17, and 1.14, respectively, and these factors accounted for 26%, 19%, and 7% of the total variance, respectively, which explains 52% of all variation in the data. The GLB for these factors was .92, .86, and 0.70, respectively, suggesting adequate reliability of the components within the factors. In the overall factor analysis, there was no problem with items belonging to multiple factors. Both the Bartlett test ($\chi^2[136] = 2568, p<.001$) and the KMO statistic (.902, “marvelous”) confirmed that the data were suited to a factor analysis, and a confirmatory factor analysis showed adequate model goodness of fit (model $\chi^2 = 318.99, p<.001$, comparative fit index 0.935, and the RMSEA = .058, $p = .059$). The model showed good reliability with a GLB of .923.

**DISCUSSION**

Cognitive empathy development in students matriculating through medical school has been well described. National normative data and cutoff scores have been reported that may be useful in identifying high- and low-scoring students, in developing strategies to support students who may need to improve their empathy skills and, perhaps, under certain circumstances, even in aspects of medical school admission decisions. Similar data have not been reported for student pharmacists. It is therefore unclear what levels of empathy should be expected at various stages of their professional development as they progress through the pharmacy curriculum or at what level remediation to improve empathy would be helpful.

The relatively high mean empathy score observed at baseline is similar to scores reported for student pharmacists, medical students, and nursing students enrolled in the first year of their respective professional curricula. No gender-related difference in baseline empathy scores was observed, and age did not affect baseline empathy scores.

Empathy scores declined over the first two years of the curriculum but increased during the last two years of the curriculum, which is contrary to trends observed in other studies and may be due to the timing at which clinical training occurs in other health professions students’ curricula. Empathy scores in other health professions students are generally stable in the early preclinical years of study but tend to decline significantly during the third and
frequent assessment of interpersonal communication. This increased exposure and application of empathy skills in the real-world settings provided by IPPEs and especially APPEs may have contributed to the increased empathy scores observed in P3 and P4. This contrasts with observations of declining empathy scores in medical students during their final years of training and may suggest differences between disciplines in how empathy is emphasized, reinforced, or modeled in the curriculum.

Students’ individual experiences with preceptors during these clinical experiences likely contributed to the enhanced empathy scores observed at the end of P3 and P4. The ability of preceptors to effectively model empathy has been suggested to impact the development of empathy in student pharmacists.\textsuperscript{36} Careful attention to student workload and preceptors’ modeling of empathic behavior may have mitigated the adverse impacts on empathy that are reported to occur during the later clinical phase of health professions education.\textsuperscript{20-32} The specific impact of experience with preceptors on empathy was not assessed in this study.

The distribution of JSE-HPS scores, although slightly negatively skewed, did not differ significantly from the normal distribution. These results are similar to findings in medical students who completed the JSE-S.\textsuperscript{19} The three-factor JSE-HPS structure found here corresponds with the structure reported for the JSE in medical students and physicians.\textsuperscript{13,18} The three factors accounted for 52% of all variation in our data; in comparison, for physicians these three factors explained 36% of the variation, and in medical students they explained 45% of the variation.\textsuperscript{13,18} In contrast, other studies in student pharmacists have reported a two-factor structure for the JSE-HPS.\textsuperscript{15,36} Different approaches
to factor analyses may account for the differences in factor structure between studies.

The results of this study are limited because it was conducted in a relatively small convenience sample of student pharmacists enrolled in a four-year Doctor of Pharmacy program at a single university. The small number of student pharmacists who completed the JSE-HPS at the end of P3 may also limit the interpretation of the results for P3. During P1 and P2, students completed the JSE-HPS as a required course self-reflection but could opt out of having their data included in the study; during P3, completion of the JSE-HPS was optional, which likely contributed to this low response rate. The mean of all JSE-HPS scores (beginning of P1 through P4) submitted by the 20 students who completed the questionnaire in P3 was significantly higher than the mean of all JSE-HPS scores of the 62 students who did not (mean [SD]: 116.8 [10.1] vs 109.0 [13.5], respectively; independent samples t test, \( p < .001 \)). This suggests that students who submitted the questionnaire in P3 were high scorers compared to those who did not; thus, the results for P3 may be biased and should be interpreted with caution.

Longitudinal development or change in student pharmacist empathy has not been previously described. We are not able to draw conclusions about changes in empathy scores over time in pharmacy programs in which students have different demographic characteristics. However, the empathy scores and factor analyses reported here are similar to the findings of cross-sectional studies of student pharmacists, which suggests that these findings may be generalizable.\(^{17,31,33,35}\) Additional longitudinal studies could validate our results and help to better elucidate how empathy changes over the course of pharmacy education.

Additionally, student pharmacists completed the JSE-HPS five times, which may introduce retest bias from multiple exposures to the same survey instrument. While this is difficult to control for, empathy scores, as measured by the JSE, have demonstrated stability over time by test-retest reliability, and retest bias is likely not a significant concern.\(^{13,49}\)

**CONCLUSION**

Empathy is a core skill that student pharmacists must develop. This longitudinal study found that empathy decreased during the early, mostly didactic years of the pharmacy curriculum but increased during the latter years, which tend to emphasize clinical experiences. Greater involvement in early direct patient care activities, which already occurs in the latter two years of the curriculum, may improve students’ empathy and prevent the decline.

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