THE SELF-CONCEPT OF CHIROPRACTIC STUDENTS AS SCIENCE STUDENTS

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ABSTRACT

Purpose: To determine the self-concepts of chiropractic students as science students and if any personal variable affect their self-concepts.

Participants: Students in their first trimester and eighth trimester at the Los Angeles College of Chiropractic during the 1993 academic year (n=158).

Methods: Peterson-Yaakobi Q-Sort, National Assessment of Educational Progress, two-tailed T-test, one way analysis of variance and Spearman-rho correlation.

Results: The majority of students have positive self-concepts as science students and although there was a difference between the 2 trimesters, it was not significant. As a group they generally had less exposure to science compared to undergraduates from a selected science program. Variables of socio-economic status, undergraduate major, and highest completed level of education did not statistically affect their self-concept.

Conclusion: Chiropractic students had the self-concept that enables them to subscribe to the philosophical foundations of science and better engage in basic sciences and, later, science-based clinical research. Knowledge of this self-concept can be used in the development of a more rigorous basic science curricula and clinical research programs at chiropractic colleges with the ultimate goal of providing a more firm scientifically based foundation for the profession. (J Chiropr Med 2005;4:70-75)

Key Indexing Terms: Chiropractic; Education

INTRODUCTION

As illustrated by Phillips,¹ the debate over the role of science in determining the best chiropractic care for patients is one that has continued unabated past the

100th anniversary of the founding of the profession and into the new millennium. As the 20th century closed Sportelli, as quoted in Phillips¹ stated that chiropractic, “. . . cannot follow the old model and anti-science which permeated much of our professional experience.” Chapman-Smith, also in Phillips,¹ put it eloquently, “Data must replace belief.”

The question that this paper examines is whether or not those who are the future of the chiropractic profession, students in chiropractic colleges, are ready to engage in a scientifically based profession. The self-concept of the chiropractic students as science students can be used to address the question.

The Issue of Science

Other health professions such as allopathic and osteopathic medicine as well as dentistry have long recognized the need for scientifically based research. In chiropractic, however, it was only during the 1990s that the Research Agenda Conferences, in response to calls for change within the profession, called for improvement in basic science research beginning with the training of chiropractic faculty in research methodology. Phillips¹ notes that there have been positive changes regarding the role of research in the profession since the Research Agenda Conference. Such changes may bode well for the profession as it seeks growth in its acceptance by other health professions and potential patients.

The problem of professional status among other medical disciplines cannot be addressed until the chiropractic profession resolves the internal problem of consensus;² a problem which Watkins³ identified as being, “. . . not one chiropractic movement, but two; namely a scientific and a philosophical movement.” Using the success of the other health professions as the example, chiropractic may want to consider a consensus, which favors scientifically based research as the basis for its techniques. The advent of such a resolution would require that the curricula at colleges of chiropractic embrace the process of science and that techniques taught are based on research that employ the process.

As chiropractic becomes a more science-based profession it will be useful to determine if those newly attracted to the profession, the students, are oriented towards science. It is assumed that those attracted to graduate programs in the natural and physical sciences as well as those attracted to the study of allopathic medicine are well oriented to science but, given this history of the profession, such an assumption cannot be made for chiropractic students. Such a determination is important, as Tyler⁴ suggests, in order for an institution to achieve its goals it must know the present condition of its students in relation to those goals. If chiropractic colleges are to make the process of science the foundation of the curricula, and the profession, then they must determine the preexisting perceptions or self-concepts that students have regarding themselves as students of science. When those perceptions have been identified, curricula can be developed to enhance the students' self-concepts as well as strengthen the tenets of the scientific process within the profession.

Self-Concepts

Educational preparation for any career, including chiropractic, is an experience that socializes individuals into appropriate patterns of behavior through the influence of role models, peer pressure, and mentorships.^{5,6} Educational experience enables the student to develop a role or subject-specific self-concept that is defined as,⁷ "... the perception individuals have of their competence when engaged in a particular task." It allows individuals to compare their behavior to what is believed to be the ideal of a particular field of study or profession.

Self-concept, particularly subject-specific self-concept, is a critical variable in education⁸ and derives from a combination of feedback an individual receives from others as well as that individual's subjective and specific experiences.⁹ The more an instructor understands self-concepts, particularly subject-specific self-concept, the better the instructor will be able to serve the academic needs of students.¹⁰ If, as Marsh¹¹ believes, subject-specific self-concept predicts academic behaviors and accomplishments and provides direction for academic interventions, then in the development of a curriculum the developer must know the subject-specific self-concepts of the students who will be exposed to the curriculum. While a self-concept instrument specific to chiropractic has not been developed, an

instrument for measuring science self-concept, the Peterson-Yaakobi Q Sort,¹² is available and has been used for the study of science students.

The Study

The purpose of this study was to determine the subject-specific self-concept of chiropractic students as science students. The information gained can be used to determine the readiness of students to engage in science beyond requirements of their formal education; to understand what constitutes good research and, to participate in research.

This study was conducted in 1993 but a literature review shows that no such study, including this one, has been published since then. Although old, the data is not dated given the dearth of similar data in the literature. This study can serve several purposes: to add to the ongoing discussion on the science-based foundation of chiropractic and subsequent changes in the curriculum at chiropractic colleges, to provide a snapshot of students and thus establish a base for future comparisons, and to encourage similar studies.

METHODS

Utilizing cluster sampling, students in their first trimester and eighth trimester at the Los Angeles College of Chiropractic (LACC) were surveyed. During the first two weeks of the academic trimester students were asked to respond to a four page questionnaire which included student demographic data and the Peterson-Yaakobi Q-Sort.

The Peterson-Yaakobi Q-Sort is a correlational instrument that can be used to determine what, if any, relation exists between two variables, such as self-concept and ideal concept, of a given group. Discrimination based on gender and socio-economic status is not significant with this instrument and with a reliability of 0.87 and its content validity established, this is a useful instrument for assessing the self-concept of individuals as science students.¹² The proportion of students with a significantly positive subject-specific self-concept on the Peterson-Yaakobi Q-Sort ($\alpha = 0.05$) was determined using the results of a Spearman rho correlation. The difference in the subject-specific self-concept between the two terms was determined by using a two-tailed t-Test.

Demographic data was collected on students' gender, family socio-economic status (SES), pre-

professional education (major), and level of education prior to matriculation at LACC. Family SES was defined without the use of absolute income as the standard. Students self-reported their family SES as upper class which was not further defined, middle class which was defined as family income coming from white collar/professional/managerial or supervisory employment, working class which was defined as family income considered to be representative of the lower middle class and coming from blue collar/sales or clerical employment, and lower class which was not further defined.

Pre-professional education was divided into five groups: natural science, physical sciences, health profession, social sciences and the arts and humanities, and business. Health professions were separated from the sciences because of the more specific course requirement imposed by professional schools (eg, medical schools) as compared to broader requirements for natural or physical sciences. Level of education was defined as: not having completed a degree program; having completed an Associates degree; having completed a Bachelors degree; and having completed a graduate or professional degree.

The effects of differences of family SES, pre-professional education and level of education on the subject-specific self-concept were analyzed using a one-way Analysis of Variance (ANOVA).

RESULTS

A combined total of 83.2% of the 112 first term students and 102 eighth term students responded to the survey. Because of improperly completed or incomplete response forms, the response for the purpose of this study was reduced to a total of 158 students or 73.8% of the students in those two terms. All demographic data was converted to arithmetic means. Of the respondents, 70.2% were male and 29.8% were female.

Prior to attending college the respondents had completed an average of 2.6 years of high school science and 2.7 years of high school mathematics. The percentage of students completing specific high school science and mathematics courses is listed in Table 1. It should be noted that five students report not having completed any of the science courses listed in the survey and an additional 20 students report having completed only a biology course among the sciences. Twelve students report having completed

TABLE 1
PRECOLLEGIATE PREPARATION IN SCIENCE
AND MATHEMATICS

COURSE	% COMPLETING	COURSE	% COMPLETING
BIOLOGY	94.8	ALGEBRA	95.5
PHYSICS	51.7	GEOMETRY	90.9
CHEMISTRY	74.4	TRIG/PRECALCULUS	64.6
AP SCIENCE	36.4	CALCULUS	22.2

only one mathematics course. Table 2 shows the reported pre-professional major and degree earned by the students prior to matriculating at LACC.

In terms of SES, the majority of students (69%) self report coming from middle class families. Among the respondents, 7.1% report coming from upper class families while 22.6% came from working class families. Only 1.3% of the students self report their family SES as being lower class.

Using a Spearman rho correlation, the results of the Peterson-Yaakobi Q-Sort indicated that where $p = 0.05$, 63.9% of the students had a positive self-concept as a science students. Among first term students, 69% had a positive self-concept and 57.7% of the eighth term students had a positive self-concept. The results of a two-tailed t-Test indicated that there was not a significant difference between the two terms where $t_{crit} (.05, 156) = 1.96$ and $t_{obs} = 1.1$.

One-Way ANOVA were completed for pre-professional preparation (major), highest degree earned and SES. As indicated in Table 3, there was not a significant difference of subject-specific self-concept attributable to differences between pre-professional majors where $p = 0.05$.

The highest degrees earned are identified as none, associates, bachelors and graduate, which included masters, doctorates and professional degrees. Of the 158 respondents, seven had earned graduate degrees including one doctorate. As indicated in Table 4, there was not a significant difference of subject-specific self-concept attributable to differences between the highest degree earned where $p = 0.05$.

The students self-reported their SES. As indicated in Table 5, there was not a significant difference of subject-specific self-concept attributable to differences of SES where $p = 0.05$.

TABLE 2
PRE-PROFESSIONAL MAJOR AND DEGREE EARNED

MAJOR	% ENROLLED	DEGREE	% COMPLETING
NATURAL SCIENCE	29.1	NONE	25.9
PHYSICAL SCIENCE	10.1	ASSOCIATE	21.5
HEALTH PROFESSION	38.6	BACHELOR	48.7
SOCIAL SCIENCE/ARTS AND HUMANITIES	12.7	GRADUATE & PROFESSIONAL	3.8
BUSINESS	9.5		

TABLE 3
ONE-WAY ANOVA FOR PRE-PROFESSIONAL PREPARATION

SOURCE	S.S.	DF	M.S.	F
BETWEEN GROUPS	0.786	4	.197	1.378
WITHIN GROUPS	21.258	153	.143	
TOTAL	22.310	157		

FCRIT (.05, 4, 153) = 2.67

TABLE 4
ONE-WAY ANOVA FOR HIGHEST DEGREE EARNED

SOURCE	S.S.	DF	M.S.	F
BETWEEN GROUPS	0.786	3	.132	0.772
WITHIN GROUPS	26.258	154	.171	
TOTAL	25.863	157		

FCRIT (.05, 4, 154) = 2.67

TABLE 5
ONE-WAY ANOVA FOR SOCIO-ECONOMIC STATUS

SOURCE	S.S.	DF	M.S.	F
BETWEEN GROUPS	0.919	3	.306	2.154
WITHIN GROUPS	21.634	154	.142	
TOTAL	22.553	157		

FCRIT (.05, 4, 154) = 2.67

DISCUSSION

Subject Specific Self-Concept

As determined through the Peterson-Yaakobi Q-Sort, the majority (63.9%) of the chiropractic students in this study have a positive subject-specific self-concept as students of science. This finding suggests a readiness on the part of the majority of students to adopt the attitudes and values of science students. Among the values are those central to the process of science such as questioning and knowing the process of science itself. There are, however, several aspects of these results that give cause for concern.

Although there is not a statistical difference between the results of the Peterson-Yaakobi Q-Sort for students in both terms it should be noted that the

results from the eighth term when students begin their internship, were 12 percentage points lower than the results for the first term or new chiropractic students. Perhaps an even more important fact is that 42.3% of the eighth term students did not have a positive subject-specific self-concept. Whether these findings existed when the students of the eighth term began their professional education or if those findings represent a change that occurred during their education up to that term cannot be determined.

A more detailed analysis of the Peterson-Yaakobi Q-Sort revealed some details that deserve mention. Although the subject-specific self-concept of the students as science students was positive for the majority of chiropractic students in the study, item analyses show that most chiropractic students are less likely than the ideal science student to develop their own problems to investigate or to ask their own questions. They are more likely to learn only what is required and are generally concerned about grades. Moreover, the students were less likely to know the main ideas of science and to engage in extracurricular science reading than would the ideal science student. These are not attributes that are desirable in a science student or a research scientist.

The results of the Peterson-Yaakobi Q-Sort were correlated with demographic data on the students' SES, pre-professional college major and the highest degree earned. Through the use of one-way ANOVAs it was determined that there was not any difference in the subject-specific self-concept caused by differences in SES, college major or the highest degree earned. As an example, students who did not earn a degree prior to matriculating at the college and students who had earned a graduate degree did not have statistically different subject-specific self-concepts. These results should not be construed as being in conflict with the results of the more recent study by Green, Johnson and McCarthy¹³ on the first year success of students at a chiropractic college. They found that the possession of a bachelors or graduate degree prior to matriculation to a chiro-

practic college did have a positive correlation with students' grade point average at the end of their first year of study at the chiropractic college. Even though my study did not show an advantage to having earned a degree prior to matriculation at a chiropractic college, Green et al's study does show an advantage but in terms of other criteria.

As a means of providing a broader view of the students' background experiences, the questionnaire included items concerning their high school science and mathematics education. Generally half the students in this study had only two years of high school science and mathematics while the other half had three years of each. As a comparison, students surveyed in my study in 1992 of female undergraduates majoring in marine science at the US Coast Guard Academy, had completed, on the average, over three years of high school science and four years of high school mathematics. The difference may be assigned to the fact that 100% students in my earlier study declared their major to be science during their freshman year while those in this study came from a variety of undergraduate majors and thus may not have the same level of orientation towards science earlier in their academic careers.

Limitations and Future Research

The study discussed in this paper is limited by its sample size, and the findings are limited to those students surveyed at the Los Angeles College of Chiropractic. Another limitation is that of the age of the data. While the findings from this study cannot be generalized to current students at all chiropractic colleges, it provides information on an aspect of chiropractic students not discussed elsewhere in the literature and thus serves as a foundation upon which other studies and comparisons can be made.

This study does, however, address, in part, the recommendations by Green et al¹³ that, "Additional research conducted throughout the teaching program may also help us better understand those students who struggle in one phase, such as the basic sciences, but perform well in other areas." Further research on subject-specific self-concepts as well as their attitudes towards science may better help chiropractic colleges better understand why some students are more successful in the basic sciences while others do struggle.

Implications

The information contained in this study is not predictive in the same vein as that of Green et al.¹³

Self-concepts on the part of prospective chiropractic students need however to be addressed by the colleges if the profession is to advance its science based foundation and develop future chiropractors who look towards science based research as the foundation for their practice.

DeBoer¹⁴ notes that Innate has created a situation which keeps chiropractic from making the, "... transition into legitimate professional education, with serious scholarship, research, and service." Also, Keating¹⁵ believes that chiropractic has made notable improvement in basic science since Watkins in the 1940s began the efforts to put chiropractic on a firm scientific foundation. Phillips¹ believes that the profession is establishing its scientific base and increasing the productivity of its research but he states that even now, "There is also a portion of the profession that continues to advocate an isolationist position or limited integration as long as it does not impinge on their perceptions of what constitutes appropriate chiropractic care." Serious scholarship includes the development on the part of students to think critically.

As Kuhn⁶ noted, any paradigm change in science comes from those not as invested in the old paradigm and Wall, Turnbull, and Vernon,¹⁶ in agreement with Kuhn, state that an attempt to change the attitude of current practitioners may reap few results. Changing the profession then will have to be a mission of the chiropractic colleges. Keating¹⁷ has through his prolific writings made clear that a goal of chiropractic education should be the development of future chiropractors with the values, attitudes and skills of the clinical scientist. Among those attributes of a clinical scientist is the ability to think critically. Moore¹⁸ states that unless students learn the value of critical thinking they will, "... continue to confuse science and pseudoscience, and will prefer the security blanket of fantasy and hocus-pocus to the use of logic, [and] the demand for evidence ..."

Donahue¹⁹ notes that a well rounded understanding of the philosophical foundations of science will enable students to better understand and apply the methodology of scientific research, including understanding research as a clinical practitioner. Keating²⁰ takes that suggestion further by recommending, "Future chiropractic clinical investigators should be oriented through lecture, discussion, and essays in the philosophy of science as it relates to

chiropractic." Keating considers all chiropractors to be potential clinical investigators and thus his recommendation is applicable to all students.

CONCLUSIONS

The chiropractic students in this study demonstrated that they have the self-concept that may enable them to subscribe to the philosophical foundations of science and become better clinical investigators. A solid foundation of information upon which an effective curricula for the education of future chiropractors may be one step in helping chiropractic to shed its marginal health profession image and become a mainline health profession, distinct from, but as accepted by, the public as is mainstream allopathic medicine.

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