



W 4.5 E16o 2007
Ebert, Didi Elise.
O[s]teopathic focus in the
biomedical sciences

UNTHSC - FW



M03H90

LEWIS LIBRARY
UNT Health Science Center
3500 Camp Bowie Blvd.
Ft. Worth, Texas 76107-2699

Ebert, Didi E., Osteopathic Focus in the Biomedical Sciences: A Survey of Biomedical Science Faculty at Osteopathic Medical Schools in the United States. Master of Science (Clinical Research and Education), May, 2007, 73 pp., 6 tables, 2 figures, bibliography, 20 titles.


The purpose of this study was to describe and evaluate the knowledge of osteopathic principles and osteopathic manipulative medicine (OMM) among biomedical science faculty at osteopathic medical schools (COMs) and to assess their attitudes towards the integration of osteopathic principles and OMM concepts into the biomedical science curriculum and biomedical science research. A cross-sectional survey was administered to biomedical science faculty at COMs within the United States. Descriptive statistics were used to characterize data, and means were compared between health science center faculty and non-health science center faculty and between anatomy faculty and non-anatomy faculty. The survey response rate was 29%. Overall, survey respondents demonstrated positive attitudes and high levels of knowledge regarding osteopathic principles and less positive attitudes toward OMM. Significant differences were noted between faculty at health science centers versus faculty at non-health science centers and between anatomy faculty and non-anatomy faculty. Data from this survey may be useful in designing strategies to increase the integration of osteopathic principles into the biomedical science curriculum.


OSTEOPATHIC FOCUS IN THE BIOMEDICAL SCIENCES: A SURVEY OF
BIOMEDICAL SCIENCE FACULTY AT OSTEOPATHIC MEDICAL
SCHOOLS IN THE UNITED STATES

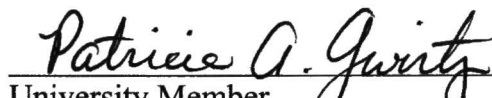
Didi Elise Ebert, B.S.

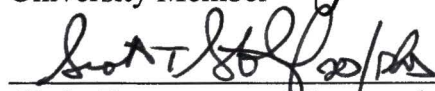
APPROVED:

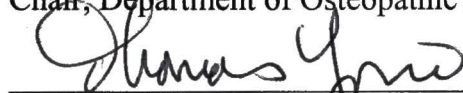

Major Professor


Committee Member


Committee Member


University Member


Chair, Department of Osteopathic Manipulative Medicine


Dean, Graduate School of Biomedical Sciences

OSTEOPATHIC FOCUS IN THE BIOMEDICAL SCIENCES: A SURVEY OF
BIOMEDICAL SCIENCE FACULTY AT OSTEOPATHIC MEDICAL
SCHOOLS IN THE UNITED STATES

THESIS

Presented to the Graduate Council of the
Graduate School of Biomedical Sciences

University of North Texas
Health Science Center at Fort Worth

in Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

Didi Elise Ebert, B.S.

Fort Worth, Texas

May 2007

TABLE OF CONTENTS

LIST OF TABLES.....	ii
LIST OF FIGURES	iii
Chapter	
I. INTRODUCTION	1
II. LITERATURE REVIEW	3
III. METHODOLOGY	7
IV. RESULTS	14
V. CONCLUSION AND RECOMMENDATIONS	24
Conclusion	
Discussion and Implications	
Limitations	
APPENDIX A.....	31
APPENDIX B	32
APPENDIX C	40
REFERENCES	71

LIST OF TABLES

Table 1: Coding Key for Data in SPSS.....	31
Table 2: Summary of Results from Section I.....	15
Table 3: Comparison of Means for HSC Respondents and Non-HSC Respondents for Items Referencing the Four Osteopathic Principles.....	20
Table 4: Comparison of Means for HSC Respondents and Non-HSC Respondents for OMT Items.....	21
Table 5: Comparison of Means for Respondents Who Taught Anatomy and Respondents Who Did Not Teach Anatomy for Items Referencing the Four Osteopathic Principles ...	22
Table 6: Comparison of Means for Respondents Who Taught Anatomy and Respondents Who Did Not Teach Anatomy for OMT Items.....	23

LIST OF FIGURES

Figure 1: Percentage of Respondents Who Agreed or Strongly Agreed with Items Referencing the Osteopathic Principles	17
Figure 2: Percentage of Respondents Who Agreed or Strongly Agreed with OMT Items	19

CHAPTER I

INTRODUCTION

Biomedical scientists (usually PhDs) and Doctors of Osteopathy (DOs) typically represent two distinct disciplines; however, their disciplines do overlap within osteopathic medical schools. In this environment, PhD scientists and DOs share responsibilities in undergraduate osteopathic medical education and in research. Though this partnership exists, little is known about biomedical science faculty's knowledge of and attitudes towards osteopathic principles and osteopathic manipulative medicine (OMM).

To enhance collaborative efforts between biomedical scientists and DOs in undergraduate osteopathic medical education and research, an assessment of biomedical science faculty's knowledge of osteopathic principles and OMM is necessary. Biomedical science faculty's attitudes towards the integration of osteopathic principles and OMM within the basic science curriculum at colleges of osteopathic medicine and with biomedical research should also be assessed.

The purpose of this study was to describe and evaluate the knowledge of osteopathic principles and OMM among biomedical science faculty at osteopathic medical schools and assess their attitudes towards the integration of osteopathic principles and OMM concepts into the biomedical science curriculum and biomedical science research.

In light of the fact that osteopathic medical schools exist in both large institutions, namely health science centers, and as smaller independent schools and the degree to which the practice of osteopathic manipulative treatment relies upon anatomic knowledge four null hypotheses were tested:

1. no significant differences in knowledge of osteopathy exist between faculty who worked at osteopathic medical schools associated with a health science center or larger university system and faculty who worked at stand-alone osteopathic medical schools.
2. no significant differences in attitude toward osteopathy exist between faculty who worked at osteopathic medical schools associated with a health science center or larger university system and faculty who worked at stand-alone osteopathic medical schools.
3. no significant differences in knowledge of osteopathy exist between anatomy faculty and non-anatomy basic science faculty.
4. no significant differences in attitude toward osteopathy exist between anatomy faculty and non-anatomy basic science faculty.

To address the purpose and hypotheses of this study, a cross-sectional knowledge and attitude survey was administered to all biomedical science faculty at osteopathic medical schools within the United States. This study was approved by the University of North Texas Health Science Center Institutional Review Board.

CHAPTER II

LITERATURE REVIEW

Currently, biomedical scientists comprise greater than 25% of the fulltime faculty at osteopathic medical schools (Sweet, 2004). These faculty are the primary teaching faculty during the first two years of medical school, but little is known about their knowledge of and attitudes towards osteopathic philosophy and principles (OPP) and osteopathic manipulative medicine (OMM).

In a 1991 survey, osteopathic interns indicated that few professors exposed them to osteopathic philosophy during the classroom years. 82% of survey respondents reported little exposure to either osteopathic philosophy or OMM, and they also noted little effort by professors to help integrate osteopathic philosophy or OMM with clinical practice (V, O'Donnell, & Grey, 1991). In a survey of osteopathic medical students, 50% reported that basic science faculty did not explain or apply osteopathic principles when possible (Kasovac & Jones, 1993). In yet another survey of osteopathic medical students, only 6% responded that "the curriculum is built around osteopathic principles," and 19% responded that "the curriculum is not built around osteopathic principles, but these concepts are frequently drawn upon in lecture." The remainder of the students (71%) felt that either "the osteopathic approach to the lecture topic [was] rarely discussed" or "osteopathic principles are taught in osteopathic courses, but are isolated from the rest of the curriculum" (McNamee, Magarian, Phillips, & Greenman, 1991).

Student and physician editorial comment from 1947 to present day suggests that OPP should be, but is not, integrated with basic sciences and other subjects (Willard, 1947). In 1978, one physician wrote that since faculty from other professions have been recruited to teach at osteopathic medical schools, there “has been a loss of emphasis on the osteopathic concept in many fields. It has been relegated to the position of an afterthought—interesting but less essential than other components of the predoctoral education” (Bradford, 1978). Twenty-three years later, a second year osteopathic medical student voiced the same opinion: “In the first year of osteopathic medical school, osteopathic medicine is presented as a separate entity from other classes, such as anatomy and biochemistry. Due to this lack of integration, the campus [OMM] office is quickly assumed to have a separate ideology. Because faculty who lack knowledge of osteopathic medicine teach classes, they do not give students an osteopathic education” (Acunto, 2001). In response to this student’s comments, a physician replies that osteopathic philosophy should be integrated in the first two years of medical school, and this physician expresses the need for the science faculty to incorporate the osteopathic philosophy into their courses as well (Beals-Becker, 2002).

This perceived lack of inclusion of osteopathic principles in the undergraduate medical education may contribute to a more global issue in the osteopathic profession—the loss of professional identity. Although differences between the clinical practice of osteopathic physicians versus allopathic physicians has been objectively documented, a greater amount of current literature describes a loss of professional identity among osteopathic physicians (Aguwa & Liechty, 1999; Carey, Motyka, Garrett, & Keller, 2003;

Johnson & Bordinat, 1998; Johnson & Kurtz, 2001). In a survey of osteopathic medical students, nearly 50% responded that there was not sufficient difference between DOs and MDs to justify two separate professions (McNamee et al., 1991). Editorials from the Journal of the American Osteopathic Association comment that professional identity loss begins during undergraduate medical education when OPP should be, but is not, adequately integrated into the curriculum (Acunto, 2001; Beals-Becker, 2002; Fogel, 2001).

In addition to contributing to undergraduate osteopathic medical education, biomedical science faculty are largely involved in research. In 1999, data from the American Association of Colleges of Osteopathic Medicine (AACOM) revealed that 63% of grant awards received by osteopathic medical schools went to PhD faculty and 65% of all extramural funding went to basic biomedical science research (Sharp et al., 1998). However, little is known regarding biomedical science faculty's attitudes towards research that would help in the understanding of OPP and OMM.

Part of the AOA's mission is to advance the philosophy and practice of osteopathic medicine through research, including basic science research, but much work is still needed to accomplish this mission (Crosby, 2004). An article covering the fifth annual Osteopathic Collaborative Clinical Research Trials Initiative Conference (OCCTIC V) stated that the osteopathic medical profession needs to increase research funding, develop a research culture, and provide research mentorship (Carlton, 2004). And at the Research Conference at the 109th Annual AOA Convention and Scientific Seminar in San Francisco, a physician attendee of the AOA Research Forum stated that

the osteopathic medical profession needs to promote an educational environment of research, strengthen its research infrastructure, and develop connections with researchers across disciplines. Another attendee at this same AOA Research Forum particularly emphasized the need to scientifically justify OMM stating, “If we can’t prove what we do scientifically, we don’t deserve to exist as a separate profession” (Schierhorn, 2005). Better collaboration between biomedical science faculty and clinical faculty may help to accomplish this mission of the AOA.

One editorial piece written by Irvin M. Korr, PhD, a physiologist with a long history of collaboration with the osteopathic profession, elucidated three reasons why scientists may be reluctant to conduct osteopathic research. The first reason is funding, of which there is very little. The second reason, according to Korr, is a misperception that “osteopathic” research is limited to studying OMT, and that “if one’s skills are in areas not directly related to the musculoskeletal system, one has no contribution to make.” The third reason is that the osteopathic principles “are so self-evident, axiomatic, implicit, and pervasive in biomedical research as to be too platitudinous [or commonplace] to raise new questions for research” (Korr, 1991).

CHAPTER III

METHODOLOGY

Study Population

At the onset of this study, there were 21 osteopathic medical schools approved by the Bureau of Professional Education of the American Osteopathic Association (AOA) that were listed on the American Association of Colleges of Osteopathic Medicine (AACOM) website. Using links from the AACOM website, contact information was obtained for all biomedical science faculty listed on the websites at the 21 osteopathic medical schools. A total of 707 biomedical science faculty were identified as the survey population.

Protection of Human Subjects

Because this study was a survey project in which the survey instrument included no subject identifiers, the researcher asked for and received an expedited review from the University of North Texas Health Science Center Institutional Review Board (UNTHSC IRB). This study was reviewed and approved by the UNTHSC IRB on January 3, 2006.

Survey Design and Administration

A 39-item self-reported survey instrument was designed to evaluate the knowledge of osteopathic principles and osteopathic manipulative medicine (OMM) among biomedical science faculty at osteopathic medical schools and to evaluate their attitudes towards the integration of osteopathic principles and OMM into the biomedical

science curriculum and biomedical science research (see Appendix A). The survey instrument included three sections: Section I – demographic information, Section II – knowledge and attitudes concerning osteopathic principles, and Section III – knowledge and attitudes concerning osteopathic manipulative treatment (OMT). Each section was one page in length, and the top of each page displayed specific instructions for completing the section.

In Section I, the survey instrument contained demographic variables that may be related to knowledge and attitudes of osteopathic principles and OMT. Data collected in Section I included the following information about the respondent: professional degree held, type of medical degree (if any) that was awarded at the institution where the respondent received his graduate training, number of years taught at an osteopathic medical school, number of years they were familiar with the osteopathic profession before employment at an osteopathic medical school, whether or not the osteopathic medical school was part of a health science center, number of contact hours with osteopathic medical students, area of biomedical science taught, whether or not the respondent was involved in research, and what type research the faculty member conducted.

Section II of the survey instrument focused on the osteopathic principles. Four fundamental principles of osteopathy were displayed at the top of the section so that respondents could refer to the principles as they responded to the survey items (Ward & Do, 2003). The survey items in Section II were designed to give information on why the osteopathic principles may not be taught or used in research. The survey items followed

the logical reasoning that if biomedical scientists were to teach the osteopathic principles or use osteopathic principles in their research, they must first:

- Be aware of the osteopathic principles
- Believe that the osteopathic principles are scientifically valid
- Believe that the osteopathic principles are relevant to the subjects that they teach
- Allow the osteopathic principles to influence how they prepare/teach their lectures
- Believe that their lectures are an appropriate forum for integrating the osteopathic principles into the biomedical science curriculum
- Be interested in learning how their teaching area could be applied to the better understanding of osteopathic principles
- Be interested in learning how their research area could be applied to the better understanding of osteopathic principles.

Statements were created mirroring this reasoning, and modified Likert scale responses were provided so respondents could indicate how much they agreed or disagreed with the statements. Section II also contained two open response items allowing respondents to openly voice their opinions.

Section III of the survey focused on OMM. A definition of osteopathic manipulative treatment (OMT) was displayed at the top of the section so that respondents could refer to the definition as they responded to the survey items (Ward & Do, 2003).

Typically, biomedical scientists would not teach OMT techniques, but they may be

involved in teaching mechanisms for the effects of OMT. The survey items in Section III were designed to give information on why mechanisms for the effects of OMT may not be taught or used in research. The survey items followed the logical reasoning that if biomedical scientists were to teach mechanisms for the effects of OMT or research the mechanism for the effects of OMT, they must first:

- Be aware of mechanisms for the effects of OMT
- Believe that the mechanisms for the effects of OMT are scientifically valid
- Believe that the mechanisms for the effects of OMT are relevant to the subjects that they teach
- Allow the mechanisms for the effects of OMT to influence how they prepare/teach their lectures
- Believe that their lectures are an appropriate forum for integrating the mechanisms for the effects of OMT into the biomedical science curriculum
- Be interested in learning how their teaching area could be applied to the better understanding of the mechanisms for the effects of OMT
- Be interested in learning how their research area could be applied to the better understanding of the mechanisms for the effects of OMT.

Statements were created mirroring this reasoning, and modified Likert scale responses were provided for respondents to indicate how much they agreed or disagreed with the statements. In Section III, the collective term ‘the mechanisms for the effects of OMT’ was used to represent any known or proposed mechanisms for how OMT works. The use

of this term may have been a limitation to this study and will be discussed further in the discussion section of this paper. Section III also contained an open response item to allow respondents to openly voice their opinions.

The survey instrument was reviewed, modified, and ultimately approved by an expert panel comprised of experienced survey researchers and representatives of the target population. The experienced survey researchers reviewed the formatting and content to assure that the survey instrument was user-friendly and appropriately addressed the research objectives. The representatives of the target population focused on survey formatting and content to assure that the terminology was understandable and that the survey instrument was not biased.

The survey instrument was administered by mail. The initial mail-out occurred at the beginning of the Spring 2006 medical school semester. The survey return deadline was one month after the initial mail-out. Two weeks after the initial mail-out, respondents received a reminder postcard.

In order to increase survey response, a graphic design survey cover, a cover letter, and a reminder postcard were also created. The survey cover displayed a large and unusual geometric design along with the survey title and the name of the institution sponsoring the study. The unusual geometric design was used to give respondents a visual image to associate with the survey and help them remember the survey. The reminder postcard displayed the exact same geometric design as the survey cover; thus, when respondents received the reminder post card, they would also remember the survey

and where they may have placed the survey. This strategy to increase survey response was selected for reasons of cost (Bourque, Linda Brookover Fielder, Eve P., 1995).

The survey instrument was accompanied by a cover letter. The cover letter was on university letter head, stated the purpose of the study and why respondents were chosen, explained how and when to return the survey instrument, and gave the contact information of the survey administrators. The researcher also explained in the cover letter that the survey was part of a masters thesis research project and that participation in the project would help the researcher to graduate. All cover letters were signed.

The initial survey mail-out also included a small, separate sheet of paper that respondents could use to give their contact information if they were interested in knowing results from the survey project.

Data Coding and Analysis

All survey data were coded for entry into an SPSS database (see Appendix A for coding key). Responses to closed questions in Section I were assigned numeric values. Open responses were recorded as entered but were also recoded as numeric values that represented categories of ranges. Responses using the modified Likert scale were also given numeric values, which allowed for the calculation of means.

Statistical analysis was done using SPSS. Descriptive statistics such as frequencies and means were used to characterize the data. In order to test the hypotheses that responses in Section II and Section III would differ based on whether or not the respondent was from a health science center or not and whether the respondent taught

anatomy or not, means were compared using independent t-tests, which included Levene's test for equality of variances.

CHAPTER IV

RESULTS

The survey response rate was 29% (203 of 707 surveys). From the returned surveys, 35 were excluded from analysis because the respondents had no direct contact with osteopathic medical students. From this point forward, 'all respondents' refers to the 168 respondents whose surveys were analyzed.

Results from Section I of the survey are summarized in Table 2. A large majority (89.9%) of the respondents were PhD scientists. Thirty-eight (22.6%) of the respondents did not complete Item 2 from the survey, but of those who did respond, 72 (42.9%) did their graduate training at an institution that awarded no medical degree. Among all respondents, the average number of years taught at an osteopathic medical school was 14.79 years. The average number of years that respondents were familiar with osteopathic medicine before employment at an osteopathic medical school was 6.11 years. One hundred thirty-one (78%) of the respondents taught at osteopathic medical schools that were part of a health science center. Among all respondents, the range of contact hours with osteopathic medical students during one academic year was very broad, with 2 hours being the least contact hours and 2,098 hours being the most contact hours. The average number of contact hours with osteopathic medical students per academic year was 155.56 hours. Among all respondents, 131 (78%) stated that they were involved in research; 10 respondents (5.95%) gave an open response to Item 9 stating that they were involved in

research that the researcher interpreted as being related to osteopathic manipulative medicine (OMM). Comments given in the open response to Items 9 and 10 were compiled and are presented in Appendix C.

Table 2: Summary of Results from Section I.

Item	Response	Percent	(N)
Professional Degree	PhD	89.9	(151)
	DO	1.8	(3)
	MD	3.6	(6)
	Other	4.8	(8)
Medical Degree Awarded at Training Institution	MD	31.5	(53)
	DO	3	(5)
	N/A	42.9	(72)
Years Teaching at Osteopathic Medical School	0 – 5 yrs	22	(37)
	6 – 10 yrs	22.6	(38)
	11 – 15 yrs	11.9	(20)
	16 – 20 yrs	16.1	(27)
	21 – 25 yrs	7.7	(13)
	26 – 30 yrs	13.7	(23)
	> 30 yrs	6	(10)
Years Familiar with Osteopathic Medicine before Employed at Osteopathic Medical School	0	46.4	(78)
	> 0 – 5 yrs	22.6	(38)
	6 – 10 yrs	11.3	(19)
	11 – 15 yrs	4.2	(7)
	16 – 20 yrs	6.5	(11)
	21 – 25 yrs	2.4	(4)
Teaches at Health Science Center	Yes	78	(131)
	No	22	(37)
Contact Hours with Osteopathic Medical Students	0 – 50	31.5	(53)
	51 – 100	28	(47)
	101 – 150	11.3	(19)
	151 – 200	8.9	(15)
	> 200	20.2	(34)
Area of Biomedical Science	Anatomy	22.6	(38)
	Histology	13.7	(23)
	Biochemistry	22	(37)
	Physiology	23.8	(40)
	Cell Biology	8.9	(15)
	Immunology	11.3	(19)
	Genetics	10.1	(17)

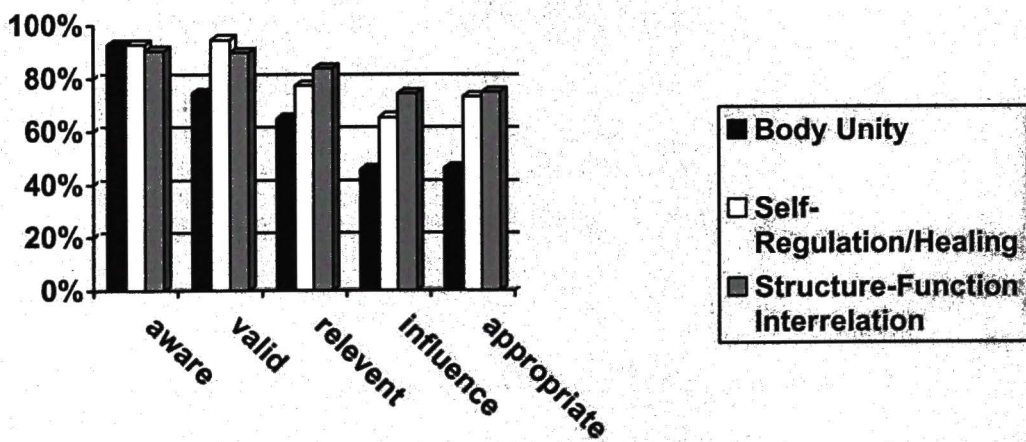
	Molecular Biology	8.9	(15)
	Embryology	8.9	(15)
	Musculoskeletal System	20.8	(35)
	Gastrointestinal System	23.2	(39)
	Cardiovascular System	23.2	(39)
	Respiratory System	20.2	(34)
	Endocrine System	19.6	(33)
	Reproductive System	19	(32)
	Renal System	21.4	(36)
	Nervous System	32.1	(54)
	Hematopoietic System	14.3	(24)
	Other	28.6	(48)
Involved in Research	Yes	77.5	(131)
	No	22.5	(38)

Note: For 'Area of Biomedical Science' the percentages do not add up to 100% because many respondents taught more than one subject.

Results from Item 11 to Item 25 of Section II are summarized in Figure 1. Among all respondents, a large majority agreed or strongly agreed that they were aware of the osteopathic principles: 92.8%, 92.8%, and 90.5% for the principles of Body Unity, Self Regulation/Healing, and Structure-Function Interrelation respectively. Fewer respondents, but still a large majority, agreed or strongly agreed that the osteopathic principles were scientifically valid: 74.4%, 94.7%, and 89.9% for the principles of Body Unity, Self Regulation/Healing, and Structure-Function Interrelation respectively. A majority of respondents also agreed or strongly agreed that the osteopathic principles were relevant to the subject that they taught: 64.9%, 77.4%, and 83.9% the principles of Body Unity, Self Regulation/Healing, and Structure-Function Interrelationship respectively. Only 45.8% of respondents agreed or strongly agreed that the principle of Body Unity influenced how they prepared or taught their lectures; however, a majority agreed or strongly agreed that the principles of Self Regulation/Healing, and Structure-

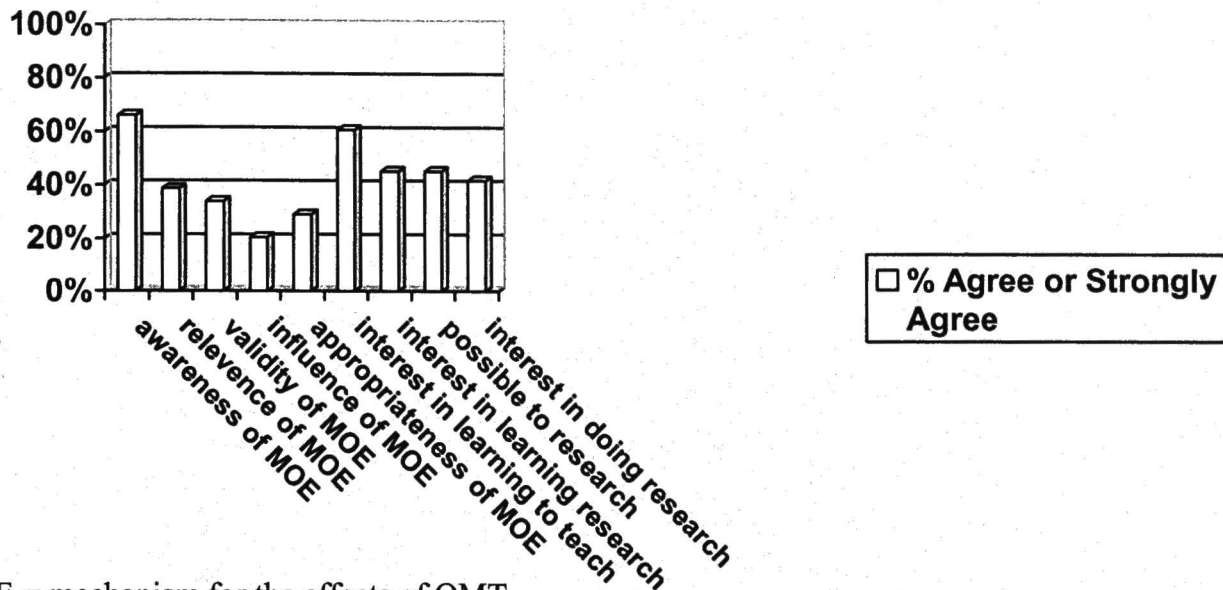
Function Interrelationship influenced how they prepared or taught their lectures: 65.4% and 74.5% for the principles of Self Regulation/Healing, and Structure-Function Interrelationship respectively. Only 46.4% agreed or strongly agreed that their lectures were an appropriate forum for integrating the principle of Body Unity into the biomedical science curriculum; however, a majority agreed or strongly agreed that their lectures were an appropriate forum for integrating the principles of Self Regulation/ Healing and Structure-Function Interrelation into the biomedical science curriculum: 73.3% and 75% respectively. A majority (64.9%) of respondents agreed or strongly agreed that they were interested in learning how their teaching area could be applied to the better understanding of the osteopathic principles, but only 42.8% of respondents agreed or strongly agreed that they were interested in learning how their research area could be applied to the better understanding of the osteopathic principles. Comments given in the open response to Items 26 and 29 are compiled in Appendix C.

Figure 1: Percentage of Respondents in Agreement with Items Referencing the Four Osteopathic Principles.



In Section III, a majority (66.1%) of respondents agreed or strongly agreed that they were aware of mechanisms for the effects of osteopathic manipulative treatment (OMT), but much fewer respondents agreed or strongly agreed that the mechanisms for the effects of OMT were scientifically valid, were relevant to their teaching subject, or influenced how they prepared or taught their lectures: 38.7%, 33.9%, and 20.3% for valid, relevant, and influenced respectively. Only a minority (29.1%) agreed or strongly agreed that their lectures were an appropriate forum for incorporating information regarding the mechanisms for the effects of OMT into the biomedical science curriculum. Over half (60.7%) of the respondents agreed or strongly agreed that they were interested in learning how their teaching area could be applied to the better understanding of OMT. With regards to research, 45.2% of respondents agreed or strongly agreed that it was possible to do research within their area that could be applied to the better understanding of OMT; 45.2% agreed or strongly agreed that they were interested in learning how their research area could be applied to the better understanding of OMT; and 41.7% agreed or strongly agreed that they were interested in doing research within their area that could be applied to the better understanding of OMT. Comments given in the open response to Item 39 are compiled in Appendix C.

Figure 2: Percentage of Respondents in Agreement with the OMT Items



MOE = mechanism for the effects of OMT

In order to test the hypotheses that responses in Section II and Section III would differ based on whether or not the respondent was from a health science center or not and whether the respondent taught anatomy or not, means were compared using independent t-tests. For all Items in Section II except the item on scientific validity of the principle, respondents from non-health science centers (non-HSCs) were more likely to agree than respondents from health science centers (HSCs); 7 of these 17 differences were statistically significant ($p < 0.05$). Respondents from non-HSCs were significantly more likely to agree that they were aware of the principles of Self Regulation/ Healing and Structure-Function Interrelation and that the principle of Body Unity was scientifically valid and relevant to the subject that they teach. These biomedical scientists also held a significantly stronger view that the principles of Self Regulation/Healing and Structure-Function Interrelation influenced how they prepared/taught their lectures and agreed that

their lectures were an appropriate forum for integrating Self Regulation/Healing into the biomedical science curriculum.

Table 3: Comparison of Means for HSC Respondents and Non-HSC Respondents for Items Referencing the Four Osteopathic Principles.

Item	HSC	Number	Mean	Significance
11	Yes	131	4.40±.89	.31
	No	37	4.57±.77	
12	Yes	131	4.35±.92	.00
	No	37	4.70±.46	
13	Yes	128	4.23±1.02	.00
	No	37	4.70±.46	
14	Yes	130	3.85±1.16	.85
	No	37	3.81±1.47	
15	Yes	131	4.25±.77	.01
	No	37	4.59±.50	
16	Yes	131	4.20±.85	.26
	No	37	4.38±.95	
17	Yes	129	3.43±1.26	.20
	No	37	3.73±1.30	
18	Yes	130	3.72±1.11	.00
	No	37	4.24±.83	
19	Yes	130	4.02±1.08	.15
	No	37	4.30±.85	
20	Yes	130	2.91±1.25	.29
	No	37	3.16±1.39	
21	Yes	131	3.29±1.28	.00
	No	37	4.00±1.00	
22	Yes	130	3.63±1.30	.01
	No	37	4.16±.99	
23	Yes	130	2.91±1.25	.10
	No	37	3.30±1.37	
24	Yes	130	3.48±1.16	.00
	No	37	4.14±.82	
25	Yes	130	3.74±1.15	.10
	No	37	4.08±1.01	
27	Yes	128	3.41±1.20	.23
	No	37	3.68±1.18	
28	Yes	120	2.95±1.28	.49
	No	29	3.14±1.41	

Note: The P-values (labeled 'Significance') were calculated using independent t-tests.

For all Items in Section III, respondents from non-HSCs were more likely to agree than respondents from HSCs, but in this section only 2 differences reached statistical significance ($p < 0.05$). Respondents from non-HSCs were significantly more likely to agree that the mechanisms for the effects of OMT influenced how they prepared/taught their lectures and that their lectures were an appropriate forum for incorporating information regarding the mechanisms for the effects of OMT into the biomedical science curriculum than were faculty from institutions with health science centers.

Table 4: Comparison of Means for HSC Respondents and Non-HSC Respondents for OMT Items.

Item	HSC	Number	Mean	Significance
30	Yes	128	3.43±1.19	.40
	No	37	3.62±1.28	
31	Yes	127	2.83±1.23	.15
	No	37	3.16±1.32	
32	Yes	126	3.02±.97	.08
	No	36	3.39±1.13	
33	Yes	123	2.20±1.02	.04
	No	36	2.72±1.34	
34	Yes	127	2.54±1.14	.03
	No	37	3.11±1.35	
35	Yes	127	3.24±1.24	.20
	No	37	3.51±1.12	
36	Yes	121	2.93±1.27	.17
	No	32	3.28±1.35	
37	Yes	127	2.99±1.28	.19
	No	35	3.31±1.28	
38	Yes	121	2.86±1.34	.12
	No	33	3.27±1.33	

Note: The P-values (labeled 'Significance') were calculated using the independent t-test.

In response to 12 of 17 Items in Section II, respondents who were anatomy faculty were more likely to agree than respondents who were not anatomy faculty, but only 3 of these differences were statistically significant ($p < 0.05$). Anatomy faculty were

significantly more likely to agree that the principle of Structure-Function Interrelation was relevant to the subject they taught, that it influenced how they prepared/taught their lectures, and that their lectures were an appropriate forum for integrating Principle C into the biomedical science curriculum.

Table 5: Comparison of Means for Respondents who Taught Anatomy and Respondents who Did Not Teach Anatomy for Items Referencing the Four Osteopathic Principles.

Item	Anatomy	Number	Mean	Significance
11	Yes	38	4.34±1.02	.43
	No	130	4.47±.82	
12	Yes	38	4.50±.76	.56
	No	130	4.41±.88	
13	Yes	38	4.42±.76	.54
	No	127	4.31±.99	
14	Yes	38	3.71±1.33	.45
	No	129	3.88±1.20	
15	Yes	38	4.45±.50	.25
	No	130	4.29±.78	
16	Yes	38	4.34±.75	.40
	No	130	4.21±.90	
17	Yes	38	3.53±1.37	.86
	No	128	3.48±1.24	
18	Yes	38	3.74±1.22	.51
	No	129	3.87±1.02	
19	Yes	38	4.50±.56	.00
	No	129	3.95±1.11	
20	Yes	38	3.03±1.39	.73
	No	129	2.95±1.25	
21	Yes	38	3.63±1.32	.30
	No	130	3.39±1.24	
22	Yes	37	4.32±.85	.00
	No	130	3.58±1.30	
23	Yes	38	3.13±1.38	.45
	No	129	2.95±1.26	
24	Yes	38	3.61±1.18	.88
	No	129	3.64±1.12	
25	Yes	38	4.21±.91	.01
	No	129	3.70±1.16	

27	Yes	38	3.76±1.22	.08
	No	127	3.38±1.18	
28	Yes	34	2.97±1.43	.94
	No	115	2.99±1.27	

Note: The P-values (labeled 'Significance') were calculated using the independent t-test.

For all Items in Section III, respondents who were anatomy faculty were more likely to agree than respondents who were not anatomy faculty; 4 of these differences reached statistical significance ($p < 0.05$). Anatomy faculty were significantly more likely to agree that the mechanisms for the effects of OMT were relevant to their teaching subject, that the mechanisms for the effects of OMT influenced how they prepared/taught their lectures, that their lectures were an appropriate forum for incorporating information regarding the mechanisms for the effects of OMT into the biomedical science curriculum, and that they were interested in learning how their teaching area could be applied to the better understanding of OMT.

Table 6: Comparison of Means for Respondents who Taught Anatomy and Respondents Who Did Not Teach Anatomy for OMT Items.

Item	Anatomy	Number	Mean	Significance
30	Yes	38	3.79±1.23	.07
	No	127	3.38±1.19	
31	Yes	37	3.84±1.04	.00
	No	127	2.63±1.18	
32	Yes	38	3.21±1.07	.44
	No	124	3.06±1.00	
33	Yes	36	3.00±1.24	.00
	No	123	2.12±1.00	
34	Yes	38	3.45±1.18	.00
	No	126	2.44±1.12	
35	Yes	37	3.68±1.18	.03
	No	127	3.19±1.21	
36	Yes	34	3.09±1.36	.65
	No	119	2.97±1.28	
37	Yes	36	3.22±1.40	.40

38	No	126	3.02±1.25	.58
	Yes	33	3.06±1.44	
	No	121	2.91±1.33	

Note: The P-values (labeled 'Significance') were calculated using the independent t-test.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

In this survey project, the researcher sought to describe and evaluate knowledge and attitudes towards osteopathic principles and osteopathic manipulative medicine among biomedical science faculty at osteopathic medical schools. Overall, a high level agreement was demonstrated with Items referencing the osteopathic principles.

Agreement with Items referencing the osteopathic principles trended downward in the following order:

- Agreement to awareness of the osteopathic principles
- Agreement that the osteopathic principles were scientifically valid
- Agreement that the osteopathic principles were relevant to the respondents' teaching subject
- Agreement that the osteopathic principles influenced how the respondents' prepared/taught lectures
- Agreement that the respondents' lectures were an appropriate forum for the integration of osteopathic principles into the biomedical science curriculum.

Agreement with items that referenced the principle of Body Unity was lower than agreement with items referencing the other osteopathic principles. Overall, agreement with statements referencing osteopathic manipulative treatment (OMT) was much lower

than statements referencing the osteopathic principles. High levels of agreement were demonstrated for awareness of mechanisms for the effects of OMT and interest in learning how respondents' teaching could be applied to the better understanding of OMT.

Significant differences in responses were found between HSC faculty and non-HSC faculty and between faculty who taught anatomy and faculty who did not teach anatomy. Overall, HSC faculty demonstrated less agreement with statements referencing the osteopathic principles and OMT. Anatomy faculty were more likely to agree to statements referencing the principle of Structure-Function Interrelation and statements referencing OMT.

Discussion and Implications

Nearly half of respondents were not familiar with osteopathic medicine before their employment at an osteopathic medical school. Another 23% were familiar with osteopathic medicine for five years or less before their employment at an osteopathic medical school. This data may represent a need to orient biomedical science faculty to the osteopathic profession upon employment at an osteopathic medical school. Within the comments in Section I, it was noted that the disciplines of biochemistry and pharmacology were not included in the answer responses for Item 7, which was indeed an error of omission.

In analyzing the survey data, 'agree' and 'strongly agree' responses were interpreted as more knowledge of or more positive attitudes toward osteopathic principles and OMM. In Section II, the knowledge of osteopathic principles, as measured by awareness, was high among respondents. The attitudes were different toward different

osteopathic principles; attitudes toward the principle of Body Unity were generally the lowest, and attitudes toward the principle of Structure-Function Interrelation were generally the highest. Many respondents commented that the principle of Body Unity could not be considered 'scientific' because of the concept of spirit, which they believed could not be studied. Another common theme of the comments in Section II was related to Irvin Korr's ideas that the osteopathic principles represented broad and generally accepted ideas that were not specific to the osteopathic profession and were not useful in generating research questions. The data from this section implied that if biomedical scientists did not incorporate osteopathic principles into their teaching or research, it was not because they were unaware of the principles but because they believed it was not appropriate to do so.

The knowledge of and attitudes toward mechanisms for the effects of Osteopathic Manipulative Treatment (OMT) were not as high or positive among respondents. In Section III, the response rate was not as high perhaps because respondents felt this section was biased, had bias themselves, or felt that the section was poorly written. Some respondents commented that the questioning in this section was poorly designed because there are different proposed mechanisms for the effects of OMT and because proposed mechanisms are often stated as fact when they have not been scientifically tested. Many respondents pointed out that some mechanisms have been scientifically validated, some have not, and some have been disproved. Cranial manipulation was specifically identified by many respondents as being scientifically unfounded.

In Section III, a minority of respondents believed that the mechanisms for the effects of OMT were scientifically valid, relevant to their teaching subject, influenced how they prepared or taught their lectures, or were appropriate content for their lecture; however, over half of respondents expressed interest in learning how their teaching area could be applied to the better understanding of OMT. This interest demonstrated an opportunity for working with the biomedical science faculty to increase the integration of OMM concepts into the biomedical science curriculum. Fewer respondents believed it was possible to do research in their area that could be applied to the better understanding of OMT or seemed interested in learning how their research area could be applied to the better understanding of OMT. Many commented that OMT was not relevant to or could not be studied in their area of research; several respondents, like Irvin Korr, mentioned the need for funding to do such research. Perhaps more biomedical science faculty would be interested in doing OMT related research if they were informed as to how their research area could be related to the study of OMT or were aware of funding sources to help them do such research.

Though the survey instrument did not directly address this topic, one observation was made during the administration of the survey. In developing a mailing list for this survey project, no source was found that contained contact information for biomedical science faculty at osteopathic medical schools. As described in the methods chapter, contact information for biomedical science faculty was obtained through each osteopathic medical school's website. The fact that no comprehensive list, registry, or organization seems to exist for biomedical science faculty at osteopathic medical schools would make

any mass communication targeted to this group difficult. This situation also implies that biomedical scientists at osteopathic medical schools may not be viewed as a unique group based on their relationship to the osteopathic profession. If a biomedical scientist does not realize his uniqueness in being associated with the osteopathic profession, it may be difficult for him to understand his role in helping osteopathic medical students establish professional identity or facilitate scientific thinking concerning OMM.

Limitations of the Study

The primary limitation to this study was the use of an unpiloted, non-validated survey instrument. A pilot survey was not conducted because of practical concerns for limited time and monetary resources. Instead, an expert panel was used to pre-test the survey instrument. Piloting the survey could have identified some of the errors within the survey that respondents identified. Also by piloting the survey, the pilot data could have potentially been compared to final data from the same respondents in order to test reliability of the survey instrument; however, this process would have required subject identifiers which would have altered the Institutional Review Board process and could have potentially discouraged respondents from answering the survey honestly or at all for fear of being identified.

A non-validated survey instrument was used in this case because no existing survey was found that would suit the purposes of the study. One of the most common threats to survey validity is sampling error, or sending the survey to people that do not represent the entire study population. This survey project attempted to avoid sampling error by sending surveys to all members of the study population. However, it is possible

that some of the population was excluded if their contact information was not on the schools' websites. Conversely, some survey recipients should not have been included in the mail-out because they did not teach osteopathic medical students; this was particularly the case with Michigan State University, whose website did not distinguish between faculty who taught for the osteopathic medical school and those that did not. Also, if any bias caused some faculty to be more likely to respond to the survey than other faculty, the results of this survey would not accurately represent the knowledge and attitudes of all biomedical science faculty at osteopathic medical schools.

APPENDIX A

QUESTION	ORIGINAL RESPONSE	CODED VARIABLE
1	PhD	1
	DO	2
	MD	3
	Other	4
2	MD	1
	DO	2
	N/A	3
3	0 – 5	1
	6 – 10	2
	11 – 15	3
	16 – 20	4
	21 – 25	5
	26 – 30	6
	> 30	7
4	0	1
	> 0 – 5	2
	6 – 10	3
	11 – 15	4
	16 – 20	5
	21 – 25	6
	> 25	7
5	Yes	1
	No	2
6	0 – 50	1
	51 – 100	2
	101 – 150	3
	151 – 200	4
	> 200	5
7 (Each area of biomedical science was recorded as an individual variable, as if it were asked, “Do you teach anatomy: yes or no?”)	Yes	1
	No	2
8	Yes	1
	No	2
11 – 25, 27 – 28, 30 – 38	Strongly Disagree	1
	Disagree	2
	Undecided	3
	Agree	4
	Strongly Agree	5

Table 1: Coding Key for Data

APPENDIX B

SURVEY INSTRUMENT

NOTE: The formatting of the following survey instrument and accompanying material has been slightly altered in order to fit the page margins required for thesis submission.

This Appendix contains the following in this order:

- A sample of the graphic design cover sheet
- The 39-item survey instrument
- The cover letter (the originals were printed on University of North Texas letterhead)
- The reminder postcard
- The request for contact information.

OSTEOPATHIC FOCUS IN
**BIOMEDICAL
SCIENCES**
SURVEY



DEADLINE: 2-14-06

UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER
GRADUATE SCHOOL OF BIOMEDICAL SCIENCES

Biomedical Science Faculty Survey

The purpose of this survey is to evaluate the knowledge of osteopathic philosophy, principles, and practice (OPP&P) and osteopathic manipulative medicine (OMM) of biomedical science faculty at osteopathic medical schools and their attitudes towards the integration of OPP&P and OMM into the biomedical science curriculum and biomedical science research. Completing this survey should take **approximately 15 minutes of your time**. Participation is completely voluntary and anonymous. Your participation is greatly appreciated.

Section I

In section I, please respond to these demographic questions regarding your career. Please either **check the correct box(s)** or **fill in the blank**.

1. What professional degree(s) do you hold?	<input type="checkbox"/> Ph.D.	<input type="checkbox"/> D.O.	<input type="checkbox"/> M.D.	<input type="checkbox"/> Other
2. If you received graduate training at a health science center, what medical degree did the health science center award?		<input type="checkbox"/> M.D.	<input type="checkbox"/> D.O.	<input type="checkbox"/> N/A
3. What is the total number of years you have taught at a college/school of osteopathic medicine?	_____ years			
4. For how many years were you familiar with the osteopathic profession before your employment at an osteopathic institution?	_____ years			
5. Is your college/school of osteopathic medicine part of a health sciences center (including a medical school plus other graduate and/or professional schools)?	<input type="checkbox"/> Yes		<input type="checkbox"/> No	
6. How many contact hours (estimated time spent with students including lecturing, tutoring, mentoring or assisting in lab) do you have with <u>medical students</u> during one academic school year?	_____ hours	<input type="checkbox"/> I do not teach medical students		
7. What area of biomedical science do you teach? (please check <i>all</i> that apply)				
<input type="checkbox"/> Anatomy	<input type="checkbox"/> Gastrointestinal System			
<input type="checkbox"/> Histology	<input type="checkbox"/> Cardiovascular System			
<input type="checkbox"/> Biochemistry	<input type="checkbox"/> Respiratory System			
<input type="checkbox"/> Physiology	<input type="checkbox"/> Endocrine System			
<input type="checkbox"/> Cell Biology	<input type="checkbox"/> Reproductive System			
<input type="checkbox"/> Immunology	<input type="checkbox"/> Renal System			
<input type="checkbox"/> Genetics	<input type="checkbox"/> Nervous System			
<input type="checkbox"/> Molecular Biology	<input type="checkbox"/> Hematopoietic System			
<input type="checkbox"/> Embryology	<input type="checkbox"/> Other _____			
<input type="checkbox"/> Musculoskeletal System				
8. Are you involved in research at your college/school of osteopathic medicine?	<input type="checkbox"/> Yes		<input type="checkbox"/> No	
9. If you are involved in research, please give a brief description of your research area.	_____			
10. Please make any additional comments that you would like regarding section I.	_____			

Section II

In section II, please respond to statements referencing the first three (A-C) of the following four principles of osteopathy (A-D), which the American Osteopathic Association has published to serve as a basic outline of the osteopathic philosophy. Your answers will be used to evaluate biomedical science faculty's knowledge of osteopathic principles. Because biomedical science faculty do not traditionally teach treatments, there are fewer statements about the fourth principle (D).

The Four Principles of Osteopathy (Foundations for Osteopathic Medicine: 2nd Ed. pg10)

- A** The body is a unit; the person is a unit of body, mind, and spirit.
- B** The body is capable of self-regulation, self-healing, and health maintenance.
- C** Structure and function are reciprocally interrelated (i.e., if the structure is abnormal, then the function will also be abnormal, and vice versa).
- D** Rational treatment is based on the understanding of the preceding three principles (A-C).

	Strongly agree	Agree	Disagree	Strongly Disagree	Undecided
11. I am aware that A is one of the four principles of osteopathy.	SA	A	D	SD	
12. I am aware that B is one of the four principles of osteopathy.	SA	A	D	SD	
13. I am aware that C is one of the four principles of osteopathy.	SA	A	D	SD	
14. A is a scientifically valid principle.	SA	A	D	SD	U
15. B is a scientifically valid principle.	SA	A	D	SD	U
16. C is a scientifically valid principle.	SA	A	D	SD	U
17. A is relevant to the subject that I teach.	SA	A	D	SD	U
18. B is relevant to the subject that I teach.	SA	A	D	SD	U
19. C is relevant to the subject that I teach.	SA	A	D	SD	U
20. A influences how I prepare/teach my lectures.	SA	A	D	SD	
21. B influences how I prepare/teach my lectures.	SA	A	D	SD	
22. C influences how I prepare/teach my lectures.	SA	A	D	SD	
23. My lectures are an appropriate forum for integrating A into the biomedical science curriculum.	SA	A	D	SD	U
24. My lectures are an appropriate forum for integrating B into the biomedical science curriculum.	SA	A	D	SD	U
25. My lectures are an appropriate forum for integrating C into the biomedical science curriculum.	SA	A	D	SD	U
26. If your lectures are not an appropriate forum for integrating A-C into the biomedical science curriculum, please indicate what you believe the appropriate forum is.					
27. I am interested in learning how my <u>teaching area</u> could be applied to the better understanding of the Four Principles of Osteopathy (A-D).	SA	A	D	SD	
28. I am interested in learning how my <u>research area</u> could be applied to the better understanding of the Four Principles of Osteopathy (A-D).	SA	A	D	SD	
29. Please make any additional comments that you would like regarding the statements in section II.					

Section III

In section III, please respond to statements regarding Osteopathic Manipulative Treatment (OMT). A definition of OMT is provided below in order to assist you. The phrase "mechanisms for the effects of OMT" in the following statements refers to those mechanisms presented throughout the Foundations for Osteopathic Medicine textbook published by the American Osteopathic Association.

Osteopathic Manipulative Treatment (OMT) (Foundations for Osteopathic Medicine: 2nd Ed., pg 1240)

the therapeutic application of manually guided forces by an osteopathic physician to improve physiologic function and/or support homeostasis that have been altered by somatic dysfunction (impaired or altered function of related components of the somatic [body framework] system: skeletal, arthrodial, and myofascial structures, and related vascular, lymphatic, and neural elements)

	Strongly agree	Agree	Disagree	Strongly Disagree	Undecided
30. I am aware of the mechanisms for the effects of OMT.	SA	A	D	SD	
31. The mechanisms for the effects of OMT are relevant to my teaching subject.	SA	A	D	SD	U
32. The mechanisms for the effects of OMT are scientifically valid .	SA	A	D	SD	U
33. The mechanisms for the effects of OMT influence how I prepare/teach my lectures.	SA	A	D	SD	
34. My lectures are an appropriate forum for incorporating information regarding the mechanisms for the effects of OMT into the biomedical science curriculum.	SA	A	D	SD	U
35. I am interested in learning how my teaching area could be applied to the better understanding of OMT.	SA	A	D	SD	
36. I am interested in learning how my research area could be applied to the better understanding of OMT.	SA	A	D	SD	
37. It is possible to do research within my area that could be applied to the better understanding of OMT.	SA	A	D	SD	U
38. I am interested in doing research within my area that could be applied to the better understanding of OMT.	SA	A	D	SD	
39. Please make any additional comments that you would like regarding the statements in section III.					

Thank you!!!

If you have any questions or comments regarding this survey, please use the following contact information:

Didi Ebert
debert@hsc.unt.edu

If you are interested in knowing the results of this survey, please give us your name and e-mail address on the small, separate sheet of paper provided and return with the survey.

January 13, 2006

Dear Sir or Madam:

Please complete the research survey on the next three pages. It is designed to assess your knowledge of osteopathic philosophy, principles, and practice and your attitudes towards the integration of these principles into biomedical science research and the basic science curricula at colleges of osteopathic medicine.

This research survey is an integral part of my thesis and is required for completion of my Masters degree in Clinical Research and Education from University of North Texas Health Science Center at Fort Worth Graduate School of Biomedical Sciences. Your answers will provide me with useful insight in structuring osteopathic medical curricula as well as allowing me to complete my thesis.

The survey should take you approximately fifteen minutes to complete and is completely voluntary. Your name will not be used in any way, and there will be no way to identify you in any reports. The survey instrument itself will not ask your name or contact information, unless you would like to receive feedback on the results of the survey.

Please fill out this research survey and mail it in the enclosed self-addressed, stamped envelope by **February 14, 2006**. The survey may also be completed and faxed to my attention, *attention: Didi Ebert*, to 817-735-2270.

If you have questions about the research survey, please feel free to contact either me (debert@hsc.unt.edu) or the primary investigator, Dr. Jay Shores, PhD (jshores@hsc.unt.edu).

Thank you so much for helping with this study. Your time is greatly appreciated.

Sincerely,

Didi Ebert
D.O./M.S./M.P.H. Candidate 2007
University of North Texas Health Science Center at Fort Worth

OSTEOPATHIC FOCUS IN
**BIOMEDICAL
SCIENCES**
SURVEY



DEADLINE 2-14-06

UNIVERSITY OF NORTH TEXAS HEALTH SCIENCE CENTER
GRADUATE SCHOOL OF BIOMEDICAL SCIENCES

Front of reminder postcard (exactly the same as survey cover sheet).

REMINDER!!!

OSTEOPATHIC FOCUS IN BIOMEDICAL SCIENCES SURVEY

Please remember to complete and return
your survey before the following
deadline:

February 14, 2006

Thank you so much for your participation!

Back of reminder postcard.

CONTACT INFORMATION FOR REPLY
REGARDING BIOMEDICAL SCIENCE
FACULTY SURVEY

Name:

Email:

CONTACT INFORMATION FOR REPLY
REGARDING BIOMEDICAL SCIENCE
FACULTY SURVEY

Name:

Email:

Sample of two cards to request contact information (actual size).

APPENDIX C

Biomedical Science Faculty Survey Comments

Survey #	Description of Research area	Additional Comments Section 1	Additional Comments Section 2	Additional Comments Section 3
1	x-ray crystallography of proteins from parasitic worms, enzymology			
2				#32 is an unacceptable general question that if anyone answers is wrong. DO's quote each other that mechanisms are fact – when in reality many are only theory
3	Molecular mechanisms of nicotine and alcohol abuse			Relatively little reliable data that support the purported mechanisms of OMT
4	Testing the efficacy of computer animations as educational tools			

5	Reprofusion injury – heart student success in med school			
6	Renal Physiology Mechanisms of salt & water transport in kidney			
7	Herpes viruses of non-human primates	How can you not list microbiology as an area of Biomedical Science?		I'm a molecular virologist studying interactions of target molecules. No OMT connection.
8	I don't believe this is relevant to the study. Microbiology research.		Osteopathic principles are best taught in osteopathic courses and perhaps in anatomy and physiology in the biomedical sciences.	OMT is a useful adjunct in the practice of medicine but not something I have personally experienced.
9	Routes of infection to the CNS by pathogenic amebae.			
12	The effects of Pb au caffeine on seizure threshold dendritic spine density in kittens. Effects of calcium channel blockers on lead effect.		It is possible to study the mind or body. How does one research spirit if it even exists.	Basically my research is toxicology of lead, caffeine, and others. If you publish the results of your study, send me a copy.

13	Alteration of structure/function of ocular lens membranes associated with development of cataract.			
14	The host-pathogen interactions of staphylococcus sp. with murine infections.			
15	The effects of exercise during pregnancy on neonatal heart development			
16	Clinical efficacy of manual techniques			
17	Autonomic regulation of heart and circulation			There is a fundamental error in the implication that anyone knows how OMT works therefore questions 30-35 are moot.
18	My research focuses on stem cells and their potential as therapy in diseased retinas and in education outreach.			
19	Transfusion medicine stem cell processing	I teach pathology as related to the above- (hematopoietic system, cardiovascular		

		r system, and immunology)		
20	Science Education Outreach			
22	Alzheimers Disease			
23	Educational research validity of teaching techniques, etc.			
24		In an active-learning, student centered medical curriculum, passive "lectures" are increasingly viewed as inappropriate and ineffective.		
25	Neuropharmacology of CNS stimulants			

27	Hematopoietic Growth Factors: CSF and related proteins; biochemistry, mechanism of action and regulation of gene expression. Mesenchymal stem cells			
29	Enzymology protein chemistry x-ray crystallography			
30	Pharmacogenetics of nicotinic systems. Aging of the CNS			
31	Drug delivery by reconstituted HDL			
32	Respiratory disease, immunology		Very biased & simplistic questions. These principles are not exclusive to Osteopathy – well known and incorp. By non-DO.	Past research meager and not much is scientifically valid. There is an absolute need to explore this area, ie. Separate myth from fact.
33	Structure and function of ligand-gated ion channels			I strongly agree with the practice of OMT. I am currently an OMT patient. However, my lectures in NSI are so basic that it

				is difficult to bring OMT into them. My research area is very far removed from anything in clinical practice.
35	Investigating role of Fas in ischemia/reperfusion injury in the heart.			
36	MRI			Career killer!
37	Development of biological grafts Wound healing Osteopathic research (trigger pts.)		Unless the above are decreed mandatory, many of the basic scientists trained in allopathic institutions will not incorporate these principles into their presentations.	Some are some are not (question 32) Can and do research in this area (question 38)
38	Cancer, cardiovascular, eye wound care (artificial skin), ONA, magnetic resonance spectroscopy, phosphorus biochemistry, ecology of the Great Lakes	You are questioning from the didactic point of view, not from the view of graduate research.	On page 1, you said, "biomedical science research." Where is the research?	There is no information in this form that is relevant to biomedical research or those who conduct biomedical research. You are discussing/evaluating didactics. The people who

				constructed this questionnaire have never themselves conducted a scientific biomedical research project.
39	Mechanism of growth hormone action			
40	Metal-induced toxicity and hypoxia signaling. I also study the role of hypoxia in tumor formation. Finally, I study the pathways involved in environmental pollutant induced toxicity.			
41	Gene regulation during herpes simplex virus infection			
42	Learning strategies and long-term recall for medical students		A- is an assertion concerning unmeasurable constructs (mind, spirit). While it is valid in practical concerns, it is untestable, unfalsifiable, and therefore unscientific. I believe all the principles are valuable, but	During my first year I have taken all available OMT classes with the first & second-year students. I find it fascinating & useful, even for a non-clinician such as myself.

			"scientific" is another matter.	
43	Mechanisms of myocardial ischemia reperfusion injury			
44	Cytokinesis and drug resistance in pathogenic and non-pathogenic yeast			
46	Nervous system			
47	We are looking at the role of natural killer cells in cancer therapy			
48	Breast cancer steroid action mammary development			
49	Muscle research – cellular and sub-cellular including investigation into OMT.			I am already involved in muscle energy application to impaired muscle function.

50	Diabetes/metabolism Oxidative stress Ybycation			I am interested in OMT research, but OJTJME my area of biochemistry
51	Human population immunogenomes & protein biochemistry of inflammation & innate immune responses			
53	HIV therapeutics Structural biology			
54	1)skeletal muscle bioenergetics 2)post mortem time of death estimation			
56	Behavioral neuroscience including effects of drugs on memory			
57	Evolution of lizards during the cretaceous period – Paleontology			31 is a weak agree 32 should change in a few years
58	Affect of specific drugs on aspects of inflammation			

59	Bioterrorism involving francisella and acanthameoba	Add microbiology to your list #7	Not all research in the biomed sciences can be directly applied to the four principles.	
60	immunopathology			
61	Effects of obesity & diabetes on coronary vascular function			
64	Glutamate and pain mechanisms Med education	#6 – Ranges would have been helpful		
67			I tend to avoid A because it is often regarded as in???	With OMT, I feel less confident B & C
68	Clinical anatomy Medical education			
69	Bionanoscience into virus detection and structure			

70	Acute and chronic pain		<p>1-Most of the osteopathic principles are self-evident to most biological scientists, it is not necessary to “teach” these principles</p> <p>2 – “spirit” is not scientific, cannot be tested</p>	<p>1 – Most of OMT remains untested</p> <p>2 – Some of the mechanisms stated are likely bogus e.g. cranial</p> <p>3 – Mechanisms currently taught and OMT effectiveness are separate issues. Both must be addressed.</p>
71	Epidemiology of parasites			
73	Cariogenic biofilms			
74	Adrenal Cell Biology			
75	Physical/biological Anthropology Ontogeny & allometry of the African ape postcranial skeleton			
76	Neural circuitry of a physiological response			

77	Control of uterine arculation during exercise in pregnancy (neurali chemical control of the circulation)		You need to define scientifically valid. Does it mean the principle is based on evidence (objectively collected or does it mean that the principle is falsifiable (a scientific hypothesis) and thus amenable to scientific investigation. In reality the osteopathic principles are stated too broadly to evaluate whether they are “valid”, as it may depend on the context – how larege of a perturbation in homeostasis or bodily integrity do you expect to be amenable to self- regulation or self healing. It is less a question of whether faculty believe the core principles are “scientific” but	#30 – if one is not aware of the mechanisms, then 31 & 32 cannot be evaluated (also 33) #38 – only if money is available to support the research
----	---	--	--	--

			<p>whether the mechanisms invoked are accurate – and whether interventions can be shown to be effective.</p> <p>#14 – 22 The self-regulation can be viewed as defense of homeostasis, which is a cornerstone of physiology.</p> <p>“Awareness” of the osteopathic principles does not influence my teaching on the core principles of physiology. They could be taught in the same way (they are facts) whether it was an audience of DO or MD students. Same for structure – function relationships. If one exists, is would be taught the same to DO or MD students, so while B & C are relevant, they don’t influence how the material is</p>	
--	--	--	--	--

			<p>taught, as it is integral to the subject matter. However, osteopathic philosophy may define these terms differently or use them in a different context than a physiologist would. We may be using similar terms, but interpretation is different.</p>	
79	Study of halocin gene regulation and function of halocins			
81	Working on development of anticancer and antiviral drugs, through the study of the target enzymes		I teach in the “problem based learning” format.	As a biochemist I work with enzyme in vitro so OMT is really not applicable, but I can see related projects where OMT can be analyzed.
83	Skeletal muscle plasticity, myonuclear domains, aging			

85	Chemotherapy of cancer & parasitic disease Chemoprevention strategies in cancer Molecular biology and genetics of tumor cell growth			
86	Medical education			
87		I used to do research on Type 2 Diabetes but have given it up due to time constraints.	I think 2 out of 3 principles are relevant and that's pretty adequate.	I think some of the proposed mechanisms of manipulation are scientifically unfounded.
89	Correlates of Medical Students Performance			
90	T cell activation & immunosuppression, Effect of thoracic lymphatic pumping on immune system.		These are not the best Q or A for many of these items (14 – 16) Maybe alternatively: The scientific evidence that supports A is : A. solidly supportive B. supported by some evidence C. weakly	Again, these are not the best Q & A's. The “real” Q's are what are the established mechanisms and supporting data? Most OMT is “black box science.”

			supportive D. non existant	
91	Studying antibiotic resistance in staphylococcus aureus.			
92	Substance abuse, serotonin, antiemetic, antidepressants, cocaine, cannasinsoids, on mechanisms of OMT treatment (cellular level)		There should be more choices.	More choices
93	Cell proliferation and signal transduction in lens epithelial cells			
94		As an associate dean of basic sciences I'm no longer directly involved in research but strongly support it.	Not really agreeing with principles A & C prevents me from answering # 26.	In my opinion the efficacy of OMT has not yet been scientifically validated.
96	Mechanisms and cataracts	NIH Funded 34 yrs.		

97	Enhancements to DNA typing tech. Variability in the human genome			
100	(1) Psych-research into learning via case conf,-pt satisfaction in healthcare centers (2) (2) Inflammation & role of cytokines	Dept. Chair & administrative duties		Again, Biochemistry is too detailed – the enzymes of metabolism, for ex. – to be appropriate. Collagen & manipulation of chemicals as well as the macro-fascia et al. – is pertinent.
101	www.lecom.edu/neo Neuroendocrine research & Alzheimer's research			
103	Steroid hormone regulation of gene expression in CG cells (glioma cell line) Steroid hormone blood levels in shards & rays			
104	Paleontology, mammal evolution	Because of curriculum revision, contact with students is halved for one year. Starting next school year student contact hours will increase.		

105	I am no longer involved in research. I used to work on amino acid transport.		The principles are very general. If I were to mention them it would not take more than a couple of minutes. Before doing so, I would want to be tutored on the implications, etc.	
107	Educational research Dinosaur ventilatinal????			I have done considerable research into the biological model for one aspect of OMT, and found it to be biologically implausible and scientifically invalid.
108	Cranial osteopathy as a psychological phenomenon (as opposed to medicine)		The metaphysical concepts of mind and spirit do not belong in the basic science curriculum.	There is little good evidence in support of any of the many forms of OMT & it is long past time for proper research.
109	Physiology & pathogenesis of the bacteria <u>Neisseria gonorrhoeae</u>			
111	Dopaminergic toxicity of heavy metals & HIV proteins			

112	Diabetes GH-IGF-I Axis Aging			
113	While I don't do research as such, I do help various researchers when they need light or electron microscopy.	As a part of my histology course I have created a website that is used by the students as an aid in the laboratory portion of the course.	While histology is primarily a study of microscopic anatomy there are many instances where disease processes can be related to microanatomical structure changes.	I am nearing retirement so it is not realistic to get involved with new research projects. If I were younger, I might.
116	Cell and tissue biology Biochemistry and molecular biology Tissue engineering	There is no question about participation in the interview process of prospective med students. I interview on the average 10 applicants/year.	A is too broad a statement – basic science has no way to understand the spirit. B is also too broad of a statement – body can maintain homeostasis but clearly cannot cure itself of cancer, and neurodegenerative and autoimmune diseases.	Not all basic science disciplines can interact with OMT. However, more attempts to rigorously test the OMT effects are needed. The results from such interdisciplinary efforts might propose or validate mechanisms that might operate in OMT. Perhaps verbal survey would produce more accurate responses.
117	Gross anatomy relevant to surgery Manipulative medicine	I was associated with chiropractic education and research for	I have always thought that idea that A, B, C, and D are uniquely osteopathic is	Personally, I am more interested in doing manipulation research than I am able to find time to

		10 years prior to my introduction to osteopathy.	unfounded rubbish that is a detriment to the profession. I would try to teach them at my institution, and I expect my colleagues would support me in doing so at any institution. 14. Is "spirit" by definition not something that can be valid scientifically? 25. I focus on normal and health. It is not my role to teach disease processes. I leave that to other faculty.	do the research I have in mind. 32. Do you mean "have been validated?" Weakly, I agree. We have a long way to go. Most of the mechanisms are relatively well understood physiological processes, but we don't know much about how manipulation affects them.
119	Not presently – CNS Pharmacology & clinical			#32 - Evidence is lacking for many OMT techniques- both basis for technique & efficacy.
120	Opioid analgesia			
121	Drug – mechanisms of hypothermia			

123	Skeletal muscle stem cells in the embryo			
124	Monoclonal antibody production to lens proteins Monoclonal antibody production to EF12????? Production of biopesticides			
127			These principles are very broad and broadly correct. They are NOT a complete system. They are a correct system. In so far as they go, there is little reason to disagree nor are these ideas uniquely osteopathic. They have been mainstreamed.	
128	Cranial osteopathic manipulation as a stress reliever for medical students Heat shock protein involvement in neurological diseases			

129	Regulation of receptor signaling	Many more hours, other than teaching hours, spent with med students as administrator, e.g., counseling, mentoring, etc.		
131	Myocardial metabolism and cardioprotection		Items 23 – 25: While the specific tenets of osteopathy are not discussed in my lectures, the concern does heavily emphasize the integrated function of the body systems (tenet A) and intrinsic mechanisms to maintain homeostasis (tenet B).	My enthusiasm for items 36, 37, and 38 is heavily dependent on availability of funding to conduct OMT-related research.
132	Neurophysiological evaluation of laser therapy			
133	Comparative biomechanics Evolution of locomotion (gait, posture) Ontogeny of locomotive function		The anatomical sciences (gross, micro, neuro, embryo) are well suited for principle C (form-f(k) relationships)	I currently collaborate with OMM faculty on one project, however, it is a minor project within my program.

			?????	#32 – Depends on the treatment – craniosacral, for example, is not just poorly supported but rather scientifically unfounded.
134	Alzheimer's Visual regeneration Heat shock proteins			OMT should only lecture on what is evidence based medicine. Facts that are based on scientific evidence and not anecdotal cases.
136			As chair of the committee for the implementation of osteopathic philosophy (since disbanded) we suggested that a clause requiring faculty to be familiar with and include osteopathic philosophy be placed in all faculty contracts. A reply was never received from the dean.	
137	Cardiovascular pharmacology; signal transduction processes			

138	Musculoskeletal diseases Metabolism and mechanical stress on muscle a...bution. ????????????			
139	Anatomical variation education			
140	XXXXX cadaver Effect of XXXX on XXXXX XXXX of anatomy			
141		Why isn't pharmacology listed as a biomedical science?		
142	Nutrition	My college of osteopathic medicine is part of a university with undergraduate as well as graduate & professional schools.		
143		Part-time employee		

144	Mechanisms of angiogenesis in rheumatoid arthritis; regulation of inflammation			
145	Comparative neuroanatomy			
146	Urinary tract cell biology			
147	Control of oxygen delivery in skeletal, diaphragm, and heart in normal, aged, and diabetic states; influence of exercise training			There is too much anecdotal rationale used in the foundation of many OMT practices. Evidence based requirements dictate the need for a scientific basis. More “real” research is needed.
148	Cell biology of cytoskeleton	Ph.D. was received at Health Science Center.		
149	Examination of the ocular lens for mechanism of cataractogenesis/prevention of cataracts.			

150	Director of Research			
151	Developmental immunotoxicology			
152	Alzheimer studies			
153	Effects of NO on inflammation			I am doing research that could be applied to the better understanding of OMT.
154	Antibiotic resistant bacteria in industrial and agricultural applications			Whether or not OMT is scientifically valid requires further testing. There are certainly areas of OMT that have been scientifically studied, but there are other areas for which additional work should be done.
156	Immunopathogenesis and immune protection in infectious diseases – Chlamydia is 1 st focus area	We do not teach in a systems approach – at least not yet.	Need a “somewhat agree” category	I occasionally use OMT principles in lecture (e.g. lymphatic flow & lymphXXXX recirculation) but this type of

				incorporation & integration is uncommon and difficult for most situations and subjects in my field.
157	Pain, neuroscience			
158	The mechanism of energy transduction in cytochrome c oxidase; proton transfer coupled to electron transfer			
159		Hours facilitating problem- based learning small groups- 2004-2005 112 hr. 2005-2006 56 hr 2006-2007 112 hr	I have a hard time defining "spirit" in the first principle.	
161	Snake venom – antivenin interactions (analytical biochemistry)			
162	Structural biomechanics of large terrestrial vertebrates; human craniofacial development & dysmorphology			

163	Comparative anatomy Comparative histology Clinical anatomy Clinical histology		The “spirit” is something that cannot be observed or described by measurements of the physical world. It therefore cannot be evaluated scientifically or treated by any physician.	I am involved in a few new research projects at my school with OMM faculty. We are interested in looking at microstructure and applying the results to functionality of muscle and ligaments.
164	Lipoprotein biochemistry and cardiovascular disease			
165	DNA repair and mutagenesis using bacterial models			
182	Smooth/cardiac muscle OMT (planned)		#27 Already know application	Some “mechanisms” are understood – many are not. More research into mechanisms needs to be done.
183	Alzheimer’s disease & chronic infection/inflammation			
184				37 – 39 NA as don’t currently conduct research

185		I am employed half-time this academic year.	#28 Should have an N/A option for those who no longer do research	#36 Should have an N/A option for those not engaged in research
186			We already work very closely with OPP and integrate relevant principles	Again, we cross teach with OPP and Physical Diagnosis. We already address the OMT issue.
191	Biochemical effects of psychoactive drugs, neuroendocrinology			
193				I believe that there are valid reasons for the effectiveness of OMT; I am not sure that they have been discovered and accurately described as of yet.
194	Cellular neurophysiology & biophysics of ion channels; molecular pharmacology			
195	Basic cardiovascular research, male/female differences in vascular/cardiac response to XXXXX stimulation.			

196	Bone health & exercise	All of our other basic science faculty have little or no experience with osteopathy (6). I am a P.T who has worked with D.O.'s (not the norm in osteopathic teaching)	I think the key to 14 – 16 is scientifically & not valid.	Again #32, the key is scientifically not valid. Clinicians outcomes are valid just not scientifically sound due to the traditional models scientific research.
197	Function and evolution of the visual system in mammals			
198	Transfusion blood products Health services			
199	Anatomy of the vertebral column	Innervation of the vertebral column		Some mechanism of OMT have been validated – others have not.
200	Exercise physiology & wellness	Does question 6 include only academic contact? I do extensive non-academic mentoring.	Physiologists “discovered” these principles long before osteopathy existed. I agreed with most of the statements before I knew	Some manipulative treatments are wonderful; some are more placebo than real. We need to determine which are which.

			osteopathy existed.	
201	Reflex and other changes in response to OMT (counterstrain) Development of a simulation of palpation for use in palpatory training			(# 37 & 38) I am doing it.
202		I used to be very involved in research, but I gave up my lab in 1998 and am retiring June 20, 2006.	Since I am retiring 27 & 28 are at this point moot questions.	36, 37, & 38 are no longer of importance to me, but I answered them as if I were still actively involved in research.
203	Neuroscience – examining the serotonergic system of the brain using systems biology			Some areas of OMT are suspect scientifically – i.e. cranial.

REFERENCES

- Acunto, B. (2001). Careless abandonment of osteopathic identity or lack of instillation in medical school? *J Am Osteopath Assoc*, 101(12), 698-9.
- Aguwa, M. I., & Liechty, D. K. (1999). Professional identification and affiliation of the 1992 graduate class of the colleges of osteopathic medicine. *J Am Osteopath Assoc*, 99(8), 408-20.
- Beals-Becker, L. (2002). Osteopathic philosophy must be the foundation of osteopathic medical education. *J Am Osteopath Assoc*, 102(3), 121.
- Bourque, Linda Brookover Fielder, Eve P. (1995). *How to conduct self-administered and mail surveys*. Thousand Oaks, Calif: Sage Publications.
- Bradford, S. G. (1978). The continuum of education in osteopathic principles. *Osteopathic Annals*, 6(7), 293-296.
- Carey, T. S., Motyka, T. M., Garrett, J. M., & Keller, R. B. (2003). Do osteopathic physicians differ in patient interaction from allopathic physicians? an empirically derived approach. *J Am Osteopath Assoc*, 103(7), 313-8.
- Carlton, A. (2004). Creating a research culture: How the osteopathic medical profession can rouse its resources. *The D.O.*, , 32-39.

Crosby, J. D. (2004). Shooting for the moon: AOA strategic plan aims high. *The D.O.*, , 23-24.

Fogel, R. M. (2001). Osteopathic medical schools should foster sense of identity. *J Am Osteopath Assoc*, 101(6), 330.

Johnson, S. M., & Bordinat, D. (1998). Professional identity: Key to the future of the osteopathic medical profession in the united states. *J Am Osteopath Assoc*, 98(6), 325-31.

Johnson, S. M., & Kurtz, M. E. (2001). Diminished use of osteopathic manipulative treatment and its impact on the uniqueness of the osteopathic profession. *Acad Med*, 76(8), 821-8.

Kasovac, M., & Jones, J. M.,3rd. (1993). Integrate osteopathic principles and practices in postgraduate medical education--now. *J Am Osteopath Assoc*, 93(1), 118, 123-5.

Korr, I. M. (1991). Osteopathic research: The needed paradigm shift. *JAOA*, 91(2), 156-171.

McNamee, K. P., Magarian, K., Phillips, R. B., & Greenman, P. E. (1991). Osteopathic vs. chiropractic education: A student perspective. *J Manipulative Physiol Ther*, 14(7), 422-7.

Schierhorn, C. (2005). Research forum emphasizes need for strategic collaboration, training. *The D.O.*, , 34-41.

- Sharp, P. C., Dignan, M. B., Blinson, k., Konen, J. C., McQuellon, R., Michielutte, R., et al. (1998). Working with lay health educators in a rural cancer-prevention program. *American Journal of Health Behavior*, 22(1), 18-27.
- Sweet, S. (2004). Undergraduate osteopathic medical education. *J Am Osteopath Assoc*, 104(11), 460-7.
- V, S., O'Donnell, N., & Grey, M. B. (1991). Osteopathic interns' attitudes toward their education and training. *J Am Osteopath Assoc*, 91(8), 786-96, 801-2.
- Ward, R. C., & Do. (2003). *Foundations for osteopathic medicine* (2nd ed.). Philadelphia: Lippincott Williams & Wilkins.
- Willard, A. S. A. (1947). Where our students come from. *JAOA*, 46(5), 313-315.

