

2018

Chiropractic usage among college students: An extended literature review

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CHIROPRACTIC USAGE AMONG COLLEGE STUDENTS:
AN EXTENDED LITERATURE REVIEW

A Thesis Submitted
in Partial Fulfillment
of the Requirements for the Designation of
University Honors

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University of Northern Iowa
December 2018

This Study by Elizabeth Schwenker entitled Chiropractic Usage Among College Students: An Extended Literature Review has been approved as meeting the thesis or project requirement for the Designation of University Honors.

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Chiropractic medicine is a complementary health approach that focuses on the use of adjustments, mainly to the spine, and is typically sought to reduce pain (Chiropractic: In Depth, 2016). The National Center for Complementary and Integrative Health, a part of the National Institute of Health, found in 2007 that more than 18 million American adults had received a chiropractic adjustment or osteopathic manipulation in the previous year. The NIH recognizes that chiropractic adjustments appear beneficial in reducing low back pain and may be beneficial in treating headaches, neck pain, and a number of other conditions with temporary minor adverse effects and very rarely severe side effects. These health difficulties occur frequently in college students; in this paper, I explore not only why we should increase access to chiropractic treatments for college students, but also outline how this could be achieved at the University of Northern Iowa. To facilitate these objectives, I conducted a comprehensive literature review and utilized these studies to form a conclusion about how access to chiropractic care may be increased at UNI.

Literature Review

History of Chiropractic Medicine

The chiropractic profession. The first crude chiropractic adjustment occurred on September 18, 1895 in Davenport, Iowa (Cherkin & Mootz, 1997, Chapter 1). Daniel David Palmer, a magnetic practitioner who adopted the title of Doctor, was approached by Harvey Lillard, a janitor at his facility who had experienced deafness for the previous 17 years (Keating, Cleveland, & Menke, 2004; Palmer, 1917). He informed D.D. Palmer that at the onset of his deafness, he had been in a cramped position and felt something move in his back. Dr. Palmer's examination found a subluxation, a chiropractic term describing the phenomenon of a partial dislocation of a joint, typically of the vertebrae, in which there is a slight separation from the

normal articulating surface. After two adjustments in which Dr. Palmer forcefully thrust the abnormality, the subluxated vertebra in Harvey Lillard's back was replaced, which Palmer proposed to have removed the abnormal pressure from his nerves, and restored his sense of hearing (Palmer, 1917). While this experimental adjustment may seem odd, the health care field as a whole at this time lacked scientific treatment and training, which paved the way for a new field of medicine (Cherkin & Mootz, 1997, Chapter 1).

Following the success of his first adjusted patient, D. D. Palmer founded a school to teach his new method which would come to be known as Palmer's School of Chiropractic (Keating, et al., 2004). After leaving the school to move to California, his son B.J. Palmer, a recent graduate of the institution, was left to manage the school; D.D. Palmer returned to Iowa, at which time the father and son ran the school together. This relationship was a rocky one, however, as the father and son were often in conflict with each other. After D.D. Palmer was arrested for practicing medicine without a state issued license but was later released after paying the fine, he again left Iowa to move to Oklahoma where he established another school. After facing conflict with the co-founder of his second school, Dr. Alva Gregory, D.D. Palmer moved once again to Oregon where he founded yet another school. It was here, in 1910, that he wrote one of the most famous Chiropractic books, *The Chiropractor's Adjuster: The Science, Art and Philosophy of Chiropractic*, which B.J. Palmer later edited and re-released as a new volume (Keating, et al., 2004).

At the same time, B.J. Palmer continued to lead and develop Palmer's School of Chiropractic (PSC) while also completing research in the field and expanding the osteological collection housed in the school for students to learn from (Keating, et al., 2004). In 1908, the school began to publish a series of books to educate others about chiropractic; these books would

come to be known as the “Green Books.” In 1910, B.J. Palmer began utilizing x-ray technology in the chiropractic profession. After the death of D.D. Palmer in 1913, PSC expanded as enrollment numbers increased drastically with World War I veterans. The wealth B.J. Palmer obtained led him to invest in the development of a radio station, which he used to broadcast messages about the chiropractic profession. In 1924, B.J. Palmer declared that the neurocalometer (NCM), a device to detect spinal subluxation that was created by Dr. Dossa D. Evins, was the only ethical way to conduct chiropractic treatments. This claim, which B.J. Palmer obstinately declared to be true despite continuously growing opposition, would lead to B.J. Palmer’s fall from his position of chiropractic authority (Keating, et al., 2004).

Moving chiropractic from an illegitimate practice to a recognized treatment began with the evolution of schools teaching chiropractic (Keating, et al., 2004). Early education concerning chiropractic care focused on churning out a high quantity of students in order for more chiropractors to enter the field and spread the profession. The end of World War I assisted in this pursuit as veterans sought civilian training; after the veteran education benefits ended, however, chiropractic school populations declined and many institutions closed. In order for schools to survive and carry on the profession, a push was made to introduce longer and more extensive curricula; additional help was found with the advancement of diagnostic equipment to better educate the students. To further the reform initiative, the National Chiropractic Association (known today as the American Chiropractic Association) combined smaller, proprietary schools into larger, non-profit schools (Keating, et al., 2004).

Around this same time, the prosecution and conviction of chiropractors increased as they were charged with practicing medicine without a legal license with approximately 15,000 prosecutions despite only 12,000 practicing chiropractors (Keating, et al., 2004). The Universal

Chiropractors' Association was founded in response to assist chiropractors with their legal concerns; chief among the concerns of law enforcement and legal teams was distinguishing what treatments fell under the umbrella of medical practice versus chiropractic. To aid in the discovery of this distinction, chiropractic literature was entered into evidence in which chiropractic philosophy and practice was described; the term "philosophy" became the distinction that separated chiropractic from other medical fields, namely Osteopathy (Keating, et al., 2004).

Eventually, pressure from chiropractors led to the establishment of state licensing that made it legal for them to practice (Keating, et al., 2004). Although Kansas was the first state to pass laws regarding chiropractic legal status, North Dakota was the first state to award chiropractic licenses in 1915. Allopatric medical professionals retaliated and pushed for the development of basic science board examinations to be required for licensure in several medical professions; these board examinations were created specifically with allopatric medical education in mind in order to make it more difficult for other professions to pass. This pressure stimulated another period of educational reform as chiropractic schools improved their curricula to accommodate these exams and expanded their emphasis on basic sciences as a foundation. Eventually, even the allopatric medical practitioners disapproved of the board examinations for multiple professions and they were repealed. The National Board of Chiropractic Examiners' board examinations, designed to be taken by only chiropractors, was then accepted by states as proper examination for legal licensure to practice in each state. The legitimacy of the chiropractic profession was also advanced by the recognition of the Council on Chiropractic Education as an accrediting organization for the chiropractic schools (Keating, et al., 2004).

The chiropractic profession faced one final, major hurdle on its way to medical recognition when the American Medical Association (AMA) established the Committee on Quackery in 1962 with the express intent to eliminate chiropractic (Keating, et al., 2004). To this end, their goal was to discredit chiropractic colleges and launch a misinformation campaign against the chiropractic profession by portraying it as unscientific. Once information was released as to the AMA's intent to discredit chiropractic, a legal suit was filed by six chiropractors. After 14 years of trials and appeals, the American Medical Association rescinded its efforts against chiropractic, although the damage against chiropractic's image had already been done. In addition to this victory for the chiropractic profession, further recognition as a legitimate profession was gained when chiropractic services were included in the Medicare program in 1973, signifying that the U.S. government recognized the merit and credibility of chiropractors (Keating, et al., 2004).

Since 1975, with an inaugural conference about spinal manipulative therapy, research into chiropractic has slowly grown (Keating, et al., 2004). By 1994, the data collected about the benefits of adjustments prompted the Agency for Health Care Policy and Research, a federal institution, to identify adjustments as one of the few recommended treatments for acute low back pain. As the reach of chiropractic expanded, the National Institute of Health formed the Office of Alternative Medicine that partnered with the Palmer College of Chiropractic in Davenport, Iowa to develop a research center. Through the research completed by this and other institutions, the benefit of spinal manipulation therapies has been established for low back pain and to a lesser extent neck pain and headaches, although the precise mechanisms of this benefit are still theoretical. Despite the barriers that are still faced in the present day, such as the persistent pseudo-scientific chiropractic ideas and the question of the meaningfulness of the term

subluxation, the amount of quality chiropractic research and knowledge continues to grow (Keating, et al., 2004).

The chiropractic theory and technique. D.D. Palmer's theories about chiropractic evolved significantly over time (Keating, et al., 2004). His first idea revolved around inflammation; Palmer believed that he could feel inflammation at the point of abnormality in his patients because of the misaligned anatomy. He would then use his hands to manipulate the anatomic structure back to its original position. He then focused his theory to the spinal column; Palmer believed misalignment - what he termed as subluxation - of the vertebral joints caused pressure on the nerves which created lack of normal functioning and pain. It has been theorized that this switch from the first to second theory was in response to criticism that he was practicing osteopathy and rebranding it as chiropractic. This second theory, which he passed on to his son B.J. Palmer, also included the idea of what passed through the nerves. Palmer believed that mental impulses, also known as Innate Intelligence, controlled the body via the brain and nerves to the tissues of the body (Palmer, 1917). It was believed that subluxations constricted the movement of the Innate Intelligence through the nerves and therefore prohibited normal operation of vital functions, such as circulation and respiration. He believed that all maladies were caused by some irregularity in an articulating surface that impeded the Innate Intelligence and that by adjusting the subluxation they could treat the root cause of the disease, compared to other health professions in which the effects of the disease are treated. The Palmers became known as "segmentalists" because they believed the spinal joints could subluxate and subsequently be adjusted independent of one another (Keating, et al., 2004).

Other chiropractors formed theories that viewed the body differently (Keating, et al., 2004). Willard Carver believed the spinal column was a system that could be subluxated in

multiple areas with these primary subluxations creating secondary subluxations; this theory came to be known as the “structural approach.” Hugh B. Logan theorized that the sacrum was the platform for the rest of the spine and should therefore be the focus of adjustments; this Logan Basic Technique inspired one of Logan’s students to develop the Activator instrument which can be used to aid in adjusting subluxations and creates the foundation for the Activator Methods Chiropractic Technique (Keating, et al., 2004).

Health Difficulties Facing College Students

There are a number of health difficulties that can be addressed through chiropractic care, with many carrying increased relevance within the college student population. College students experience a number of unique conditions that can lead to increased prevalence of health difficulties, such as laptop and backpack usage and physically demanding college majors (Obembe, Johnson, Tanimowo, Onigbinde, & Emechete, 2013; Heuscher, Gilkey, Peel, & Kennedy, 2010; Kennedy, Kassab, Gilkey, Linne1, & Morris, 2008). The health conditions that are discussed below include low back pain, neck pain, and headaches, all of which will later have additional sources to support how chiropractic adjustments can benefit those suffering from these conditions.

Students in India were surveyed to determine the prevalence of low back pain experienced during the previous year (Aggarwal, Anand, Kishore, & Ingle, 2013). Researchers found a rate of occurrence of 45.3% among males and 50% among females at any point in the past year, while additionally noting a prevalence of 32.5% overall at the time of the study. The rate of occurrence was highest in students who were in their final year of study (57.5%) and lowest among those in their first year of study (32.5%), although this relationship was beyond statistical significance ($p = .13$). Researchers strongly associated low back pain with the

consumption of coffee ($p = .03$), body posture ($p < .001$), and place of study ($p = .010$). Some psychological factors – such as anxiety or depression – were also more commonly found among those with low back pain at statistical significance while carrying a backpack was close to statistical significance ($p = .07$), with researchers noting that backpack weight increased as the length of time in the program lengthened (Aggarwal, et al., 2013).

Using the National College Health Assessment (NCHA), college students in Colorado were surveyed to assess how psychological factors affect the prevalence of low back pain (Kennedy, et al., 2008). Among the 973 participants, 42.8% indicated that they experienced back pain within the previous year. Although a total of five psychological stress factors were included in the survey, only three were statistically significant in relation to low back pain. Students who reported feeling “very sad” seven or more times within the year preceding the survey reported a 53.6% prevalence of back pain ($p < .001$), those who felt exhausted 11 or more times reported a prevalence of 51.6% ($p = .002$), and 48.4% of students who felt overwhelmed 11 or more times in the same period reported back pain ($p = .003$). The other two psychological factors, “feeling hopeless” and depressed, showed similar relationships to back pain although the correlation did not reach statistical significance (Kennedy, et al., 2008).

A study conducted in Limerick, Ireland found that college students in physically demanding academic programs - such as Equine Science, Physical Education, and Sports & Exercise Science - were at an increased risk for back pain with a 32% prevalence of lower back pain within the past 12 months (Brennan, Shafat, Mac Donncha, & Vekins, 2007). Two factors associated with low back pain among these students were age, with older students more likely to experience pain, and number of hours the student participated in physical personal training activity in which those who trained more were at an increased risk. The difference in hours of

personal training were 14.0 ± 8.2 hours a week for those reporting low back pain and 11.2 ± 7.5 hours a week for those who did not experience low back pain ($p = .02$). Furthermore, 77% of these individuals indicated that the pain was recurring with 43% reporting not visiting a medical professional for the pain and only 36% reporting the use of coping strategies such as core exercises and stretching. Additionally, 36% of students reported being absent from work, sports, and education up to a month due to the low back pain. When asked if their educational program provided enough information about low back pain, 65% answered no with 64% indicating interest in attending a clinic for their back pain. The authors also cited previously conducted research that concluded that lower back pain typically does not heal spontaneously and instead persists over a year-long period unless medical assistance is utilized (Brennan, et al., 2007).

The prevalence of low back pain among Australian physiotherapy students aged 17-22 years old was studied (Nyland & Grimmer, 2003). Researchers found that 27.2% of respondents experienced low back pain in the past week and past month, 17.6% experienced low back pain in the past month but not the past week, and 19.6% experienced low back pain in the past year but not the past month. First year students reported significantly less prevalence within the past week compared to all other ages, while students in their final year of study reported significantly higher prevalence in the other measures of time when compared to students in other years of study. Sitting while looking down in excess of 20 hours within the previous month was also associated with one-month prevalence of low back pain (Nyland & Grimmer, 2003).

A survey was conducted to understand the relationship between backpack use and low back pain (Heuscher, et al., 2010). Among the Colorado State University students, 29.2% of responding students (specifically from the health education program) reported significant low back pain that interfered with activities of daily living within the previous year, with female

students and those who worked being more likely to report low back pain. Among the students surveyed, the average weight of the backpack carried was 5.2 kilograms, or 11.5 pounds. For each 4-kilogram increase in backpack weight, a 25% increase in odds of experiencing pain was noted. The authors also noted that only 12.3% of students reporting low back pain sought chiropractic care as a treatment (Heuscher, et al., 2010).

Students were surveyed at the Obafemi Awolowo University in Nigeria to determine the relationship between musculoskeletal pain and students carrying a laptop (Obembe, et al., 2013). Of the 376 students who completed the survey, 70.2% carried laptops that weighed 10-15% of their body weight with an additional 1.9% carrying a laptop that was greater than 15% of their body weight. Among participants, 91% experienced pain in their low back, neck, or upper extremities; of these students, 69.2% experienced pain in their neck and 63.6% reported pain in their low back. This study found a statistically significant association between pain and using the laptop while in bed, spending more than two hours each day on the computer, and using the computer for up to four hours without taking a break (Obembe, et al., 2013). The authors of this study also noted a study conducted by Adedoyin, Idowu, Adagunodo, Owoyomi and Idowu (2005) in which it was found that computer users who complained of musculoskeletal pain most commonly cited their back and neck as the areas of pain.

A study conducted in Thailand determined that 33% of college students experience persistent neck pain with approximately half experiencing intermittent pain over a 1-year period following the initial survey (Kanchanomai, Janwantanakul, Pensri, & Jiamjarasrangsi, 2011). Improper computer screen position, in which the computer screen was not level with their eyes, was associated with the onset of neck pain in 50.8% of respondents. Improperly high keyboard position indicated an increase in persistent low back pain prevalence at a rate of 25.9% ($p = .009$)

while only 9.2% of respondents who spent more than 70% of their time on the computer for entertainment purposes reported pain ($p = .036$). Researchers discussed the possibility that this decrease in prevalence may be due to changing sitting position frequently during computer game playing and that this decrease in static posture for extended periods of time is beneficial. Additionally, second year students were more likely than first year students to experience persistent neck pain at a rate of 1.9 times higher (Kanchanomai, et al., 2011).

A survey of graduate students explored upper extremity and neck pain of students in the Computer Science and Electrical Engineering program (Schlossberg, et al., 2004). Of the 206 students who took part in the study, 64% reported either persistent or recurrent pain in their neck or upper extremities during the course of their program with 60% associating their pain to computer use. Only 34% of these students sought the care of a medical professional for their pain (Schlossberg, et al., 2004). The researchers also compared this data to previous studies; most notably, Berqvist et al. (1995) indicated that 62% of computer users in the workplace reported neck or shoulder pain in the previous year (as cited in Schlossberg, et al., 2004).

Building on previous studies that reported the frequencies of headaches among college students, Attanasio and Andrasik (1987) asked students to report various qualities of any headaches they experienced at 1-, 4-, and 8-week intervals. This study found that 47.5% of all subjects reported 1-2 headaches a week, an amount the researchers deemed “fairly frequent,” with females reporting a statistically significant increase in frequency when compared to their male counterparts; additionally, 48.3% of subjects reported headaches that lasted up to 4 hours, with females experiencing longer lasting headaches than males. Furthermore, approximately 1/3 of males and 1/2 of females reported headaches interfering in their planned activities with the majority of students (71%) indicating their headache to be a tension headache. While less than a

quarter of students indicated that they had sought the help of a physician as a result of their headaches, a number of respondents stated they would attend special treatment for their headaches if it were available on campus (Attanasio & Andrasik, 1987).

Undergraduate students in Southern Brazil were surveyed in order to better understand how often they experienced headaches and how these headaches affected their life within the previous three months (Falavigna, et al., 2010). Of the 1,092 students who were included in the study, 74.5% reported headaches; from these students, 40.9% reported experiencing a headache once a week or more and 39.3% reported experiencing a headache once a month. Students who reported experiencing headaches were asked to describe the type of headache they had; tension-type headaches were reported at a rate of 12.8%. The authors of this study also noted previous studies conducted in Brazil in which Bigal, et al. (2001) found a 32.9% prevalence of tension-type headaches among students and Catharino et al. (2007) found that 24.4% of students who experienced a tension-type also reported decreased studying productivity during the headache (as cited in Falavigna, et al., 2010).

A study of undergraduate students in Palestine explored how they were affected by headaches (Sweileh, et al., 2010). When asked about the frequency of their headache, 25.6% of students reported one headache per week and 35% reported up to three headaches per month; this number was reported by the authors as 60.6% of students experiencing frequent headaches. Among those who experienced frequent headaches, some characteristics were significantly associated, including moderate-to-severe pain and the need to limit or avoid activities. Frequent headaches were significantly associated with some factors that triggered the onset of a headache, with 80% of frequent headache sufferers reporting stress or tension ($p = .017$), 77.6% indicating sleep deprivation ($p = .01$), and 51.7% reporting missed meals ($p < .001$) (Sweileh, et al., 2010).

Benefits of Chiropractic Medicine

As previously stated, research to quantitatively describe the benefits of chiropractic adjustments is a relatively recent development. While the exact mechanism for how an adjustment affects the body is still unknown, a number of theories exist. More research has been aimed at describing the outcomes of a chiropractic adjustment; subsequent sections of this paper show how chiropractic adjustments reduce low back and neck pain in addition to headaches.

Theorized biological basis of benefits. Using manipulation to treat maladies began long before chiropractic as a profession was established; Hippocrates recommended looking at the spine to determine the cause of a disease (Cherkin & Mootz, 1997, Chapter 10). Research into the benefits of adjustments has been a more recent development, with Triano (1992) quantifying the force that must be applied during the adjustment for the patient to see benefit (as cited in Cherkin & Mootz, 1997, Chapter 10). Triano's work discovered that approximately 500 Newtons of force must be applied for the action to be potentially effective in treating the subluxation. If the proper force is applied correctly to the subluxation, it has been hypothesized that either mechanical or neurological issues can be treated (Cherkin & Mootz, 1997, Chapter 10).

In the case of mechanically based subluxation, hypomobility is caused by a strain or sprain in a joint of the spinal column with localized or referred pain and muscle spasm (Cherkin & Mootz, 1997, Chapter 10). This misalignment may be caused by a number of factors, including adhesions due to previous injury or degeneration, or spasms deep in the muscles located adjacent to the spinal column; the pain associated with mechanical subluxation is caused by an entrapment of nerves within the tissues of the spinal column which are heavily innervated by sensory receptors associated with pain. In the process of adjusting the subluxation, these

mechanical abnormalities are hypothetically treated by releasing the entrapped tissues, breaking the adhesions, or stretching the spasmed muscles (Cherkin & Mootz, 1997, Chapter 10).

Conversely, neurologically based subluxations are due to spinal dysfunctions affecting the nervous system structures located in and around the spinal column; these nerves traveling through the opening between vertebra (also known as the intervertebral foramen) are compressed or irritated by the subluxation (Cherkin & Mootz, 1997, Chapter 10). This misalignment can cause pain, reduced sensation and motor functioning, or abnormal visceral functioning directly associated with the affected nerves via the lessened ability for nerve impulses to travel through the nerve; or the subluxation can cause persistent pain and hypomobility due to abnormally long-lasting nerve impulses. Adjustment of the neurological subluxation has been hypothesized to treat these symptoms via two actions. In the first hypothesized mechanism, the force of the adjustment relieves the compressed nerve in order to restore normal impulse conduction. The second hypothesized mechanism for fixing the neurologically based subluxation proposes that the cavitation (or cracking sound) associated with the adjustment produces an abnormally high amount of stimulation that inhibits the nerve's pain impulse production (Cherkin & Mootz, 1997, Chapter 10).

Studies illustrating benefits. Following a study previously conducted about the reduction of low back pain in patients treated by chiropractors versus hospital-based, outpatient treatment, long term outcomes were reported (Meade, Dyer, Browne, & Frank, 1995). In the initial study, follow up with patients at both six weeks and six months post-treatment showed a greater improvement in those patients treated by chiropractors. The follow-up three years after treatment continued to show better outcomes among those treated by a chiropractor; these patients showed a 29% greater improvement over those treated in the outpatient setting. A small

proportion of patients originally referred to the outpatient treatment group also saw improvement in their pain rating when treated by a chiropractor after the initial treatment period. Additionally, patients who presented with a short episode of current symptoms, a previous history of back pain, and those with higher pain rating found more benefit from chiropractic adjustments (Meade, et al., 1995).

A study conducted in Canada explored the effectiveness and cost-effectiveness of both chiropractic and medical care for low back pain (Manga, Angus, Papadopoulos, Swan, 1993). Funded by the Ontario Ministry of Health, researchers concluded that spinal adjustments performed by chiropractors were more effective than other treatments, including medical therapies and spinal manipulations performed by “non-chiropractic professionals”. Additionally, chiropractic adjustments were shown to be safer and more cost-effective than medical intervention; the study further noted that those receiving chiropractic care versus other forms of low back pain management experienced fewer hospitalizations and a significant decrease in chronic problems which in turn led to lower levels and duration of disability and time missed from work as a result of low back pain (Manga, et al., 1993).

The effectiveness of chiropractic adjustments compared to muscle relaxants in the treatment of low back pain was studied by Hoiriis, et al. (2004). Three groups were formed: those receiving legitimate chiropractic adjustments and placebo medication, those receiving sham chiropractic adjustments and muscle relaxant medication, and those receiving both sham adjustments and placebo medication. At the conclusion of the two-week study, individuals receiving chiropractic adjustments reported statistically significant improvement over those receiving the placebo and significant improvement in scores of the Global Impression of Severity Scale - an outcome assessment tool measuring limitation of activities of daily living, tenderness,

spasm, lumbar flexion, and pain rating - over both placebo and muscle relaxants (Hoiriis, et al., 2004).

In a landmark meta-analysis published in 2010 and cited by the National Institute of Health as evidence supporting the efficacy of chiropractic care, Bronfort, Haas, Evans, Leininger, & Triano (2010) studied five systematic reviews that covered 70 randomized clinical trials concerning the benefits of spinal manipulation in treating low back pain and concluded that spinal manipulation was an effective treatment. Further, it was noted that The American College of Physicians/American Pain Society includes manual therapy in the recommended treatment of low back pain in acute, subacute, and chronic stages. Based on these findings, Bronfort, et al. stated that there is a high level of evidence for the efficacy of spinal adjustments in treating chronic low back pain and moderate evidence for the efficacy of spinal adjustments in treating acute low back pain (Bronfort, et al., 2010).

As part of their extensive meta-analysis, Bronfort, et al. (2010) also reviewed literature regarding mechanical neck pain. Spinal manipulation was found to be effective in treating neck pain in six systematic reviews with The American Physical Therapy Association guidelines also suggesting cervical spine manipulation as a treatment for neck pain. Based on these findings, Bronfort, et al. concluded that spinal manipulation holds a moderate amount of quality evidence for the reduction of acute, subacute, and chronic neck pain (Bronfort, et al., 2010).

An extensive study was conducted involving 1,090 patients seen by 83 chiropractors who performed upper cervical adjustments to treat neck pain (Eriksen, Rochester, & Hurwitz, 2001). After a mean of 2.4 adjustments in a 17-day period, patients' perceived neck disability when completing activities of daily living was improved by 47.1% with neck pain improving by an

average of 56.8%; additionally, headache pain improved by 62.8%, thoracic pain improved by 58.6%, and lumbar pain improved by 57.0% (Eriksen, et al., 2001).

A clinical trial by Kassak, Anderson, Assment, Center and Edina (1995) about the effectiveness of spinal manipulation to treat tension-type headache intensity showed statistically significant improvement versus a group treated with medication; those evaluated four weeks after receiving six weeks of treatment reported experiencing less intense tension-type headaches. The use of chiropractic adjustments of the cervical spinal region to decrease the severity of tension-type headaches was also explored (Mootz, Dhami, Hess, Cook, & Schorr, 1994). As a result of the treatments, headache frequency was significantly reduced by more than half, from a mean of 6.4 headaches within a two-week period to 3.1 within the same timeframe; duration was also significantly reduced by slightly less than half, from a mean of 6.7 hours per headache to 3.88 hours. Pain intensity was reduced by slightly beyond statistical significance ($p = 0.059$), from a mean rating of 5.05 to 3.37 (Mootz, et al., 1994).

Side Effects and Risks of Chiropractic Care

As with any medical treatment, there are a number of risks associated with chiropractic medicine. The National Institute of Medicine has noted that while risks are present, the minor side effects are typically temporary and severe risks are rare (Chiropractic: In Depth, 2016). Regardless, it is important to understand that while chiropractic adjustments may be beneficial for treating the previously discussed health difficulties, adverse effects may occur.

Minor adverse effects. Approximately half of all patients who receive a spinal manipulation experience short-term, mild-to-moderate adverse effects (Stevinson & Ernst, 2002). One study included in the review found that about one quarter of manipulations resulted in one or more adverse effects, with the most common effect being local discomfort, followed by

headache, tiredness, radiating discomforting, and other effects with frequencies under 10%. The majority of these reactions (74%) subsided within 24 hours (Stevinson & Ernst, 2002)

Senstad, Leboeuf-Yde, and Borchgrevink (1997) found similar rates in their research; following an average of 4.5 chiropractic visits, 55% of patients reported experiencing one or more minor reactions to the adjustment. Of those who experienced an adverse effect, 53% reported local discomfort, 12% reported headache, 11% reported tiredness, and 10% reported radiating discomfort. The majority of patients stated that their adverse effect was gone 24 hours after their adjustment. There was a higher incidence of adverse reaction reported among women after receiving their first adjustment in which either multiple regions or only the thoracic region was treated (Senstad, et al., 1997)

Severe adverse effects. Stevinson and Ernst (2002) also completed a comprehensive review regarding serious adverse effects related to spinal manipulation. Of the 295 cases identified, 29 fatal vertebrobasilar accidents were reported, with an additional 136 nonfatal vertebrobasilar accidents; vertebrobasilar accidents occurred after rotational cervical adjustment. Disk herniation or cauda equina syndrome occurred in another 61 cases; these adverse effects were most likely to be associated with manipulations to the lower back, or lumbar region. There were also a number of cases reported in which a dislocation or fracture of the vertebra was accompanied by spinal cord compression (Stevinson & Ernst, 2002).

Studies aimed at understanding the prevalence of serious adverse effects are assumptive as a number of cases go unreported and the number of overall spinal manipulations is unknown. Studies have been conducted with the goal understanding the incidence rate, although the conclusions can vary greatly. Stevinson and Ernst (2002) identified a number of studies that reported incidence rates; these numbers ranged from 1 severe complication per 400,000

manipulations to 1-2 severe adverse events per million treatments. This number does shift slightly when controlling for age; Rothwell, Bondy, and Williams (2001) found that for patients under the age of 45, the incidence increased to 1.3 cases of vertebrobasilar accident specifically per 100,000 spinal manipulations, with the patients being 5x more likely to have visited a chiropractor in the week prior to their complication when compared to patients of a similar age without a history of vertebrobasilar accident (Rothwell, et al., 2001).

As part of a study conducted to determine if Canadian health care should include more access to chiropractic care, Manga, Angus, Papadopoulos, Swan, (1993) found no significant evidence that spinal adjustment when performed by chiropractors is an unsafe treatment for low back pain. The study further noted that while a number of medical treatments are as safe as chiropractic manipulations, there are others that are unsafe and lead to further complications for patients (Manga, et al., 1993).

Making a Case for Increased Access

As shown, college students experience a number of health difficulties that can be addressed through chiropractic treatments with limited side effects. Therefore, we should increase access to chiropractic services in order to improve the health and wellness of our local college students. Beyond the benefits already explained, chiropractic care is cost effective with patients reporting high satisfaction and confidence in their chiropractor. While many still hesitate because of the risks associated with spinal adjustments, studies have shown that the benefits of chiropractic care far outweigh the risks.

Cost effectiveness. While the office costs for patients receiving care for low back pain from a chiropractor are 78-82% higher than those receiving care from a medical doctor, overall costs are only 22% higher for acute pain patients and 16% lower for chronic pain patients

receiving care from a medical doctor (Haas, Sharma, & Stano, 2005). The authors noted, however, that these figures do not accurately reflect the cost of care; this cost does not include physical therapy that a medical doctor may recommend (comparable to the modalities typically performed by a chiropractor during their adjustment), hospitalizations, surgical costs, referrals to other providers, and advanced imaging. Supporting the acknowledgement of these additional costs, Manga (2000) noted that a chiropractor's own services constitute 80% of the costs to their patient whereas only 23% of the cost when visiting a medical doctor go to that provider. When acknowledging these additional costs, Haas, et al. (2005) concluded that chiropractic care is a cost-effective treatment for chronic low back pain and improving functional disability; Manga (2000) also found that chiropractic costs are lower when treating low back pain compared to medical costs.

Patient satisfaction and confidence. Consistently, studies have shown that patient satisfaction is very high for those who receive services from a chiropractor. Haas, et al. (2005) found that patient satisfaction is very high for those visiting a chiropractor, versus only moderate satisfaction with the services they receive from a medical doctor in response to chronic low back pain. Furthermore, this study found that patients consistently had more confidence in their chiropractor, with 83.5% of those choosing to visit a chiropractor for their chronic low back pain expressing confidence and 93.0% of acute pain patients expressing confidence (Haas, et al., 2005). Even though those receiving chiropractic treatment visit their practitioner more times than those receiving medically managed care, their satisfaction was significantly higher (Manga, 2000).

Benefits outweigh risks. Most studies conducted report that the benefits of chiropractic adjustment far outweigh the risks, as serious complications are very rare. In fact, Eriksen,

Rochester, and Hurwitz (2001) surveyed 83 chiropractors with a mean number of career adjustments per chiropractor calculated at over five million with no severe complications reported. Rubinstein, et al. (2007) noted that while over half of the subjects in their study experienced a side effect as a result of chiropractic treatment, only 5 participants (1% of the cohort) reported their overall assessment to be much worse at the end of the study period compared to the beginning; this was further supported by the fact that the majority of adverse effects were experienced at the beginning of treatment and decreased with time. Additionally, the authors noted that many of the symptoms reported as an adverse effect were present in many subjects prior to treatment, suggesting that the symptom may have been present before the onset of treatment but reported afterward. Adverse symptoms typically diminished within 24 hours after treatment, compared to symptoms experienced before chiropractic care which may have been experienced for a longer duration. Regarding the benefits of chiropractic care, Rubinstein, et al. noted that many patients found improvement in their condition, with 48% recovered after four visits to the chiropractor and 65% of patients continuing to improve 3 months after treatment.

On Our Campus – Increased Access at UNI

Musculoskeletal disorders are the most common cause of chronic health problems and long-term disability and ranked second for cause of days of restricted activity and use of over-the-counter and prescription medication (Manga, 2000). With low back and neck pain and headache having such a detrimental effect to college students, increased access to chiropractic services could help improve the quality of life, ability to learn, and future success of our college students. Many students are interested in lower back pain management but lack awareness and

choice for where to receive quality and effective care (Brennan, Shafat, Mac Donncha, & Vekins, 2007).

A number of chiropractors are located in the Cedar Falls area, but a lack of transportation and time to commute may hinder students' ability to seek these services. The addition of an on-campus, community-based chiropractor that operates separately from the University of Northern Iowa and its student health center would be one option to improve access. A unique opportunity lies in a potential partnership with Cedar Valley Physical Therapy Sports Rehabilitation, located in the UNI Human Performance and Wellness Center, an on-campus facility (Cedar Valley Physical Therapy Sports Rehabilitation, 2017). The addition of a chiropractor to the staff of the privately-run business would bring access to chiropractic care closer to the students of the University of Northern Iowa, while utilizing already implemented business practices such as insurance billing.

Another opportunity lies in the integration of a chiropractor into UNI's Student Health Clinic, an on-campus, university-sponsored organization (Student Health Clinic, 2018). The center currently offers a variety of services, including general medical care, routine health examinations, immunizations, women's services, and lab testing. All registered UNI students pay a mandatory fee that is included in tuition and applied to all students taking 5 or more credits per semester. The integration of a chiropractor into the Student Health Center would give thousands of students access to their services in a convenient, on-campus location (Student Health Clinic, 2018).

Integration of a chiropractor into a university setting does present monetary challenges. Although many insurance policies cover chiropractic care, not all do (Legoretta, et al., 2004). As previously noted, Manga (2000) stated that a chiropractor's own services constitute 80% of the

costs to their patient. Balancing the upfront cost of employing a chiropractor while budgeting for insurance repayment for services which may or may not be covered is difficult. Salsbury, Goertz, Twist, and Lisi (2018) surveyed a number of chiropractors who were working in an integrative setting - that is, other types of health care professionals - and found a range of salaries from \$40,000 to \$255,000, with a median annual salary of \$112,500. It should be noted that a number of these chiropractors also held leadership positions within their organization that may warrant a higher pay. If we utilize UNI's fall 2018 enrollment numbers, as found on UNI's website, we can divide the median cost of a chiropractor working in an integrative health setting by the 11,212 students to find that the cost per student would be \$10.03; adding this amount to the already assessed student health fee would bring the fee up to \$139.03 (Office of University Relations, 2018). Salsbury, et al. (2018) also noted that this median salary is significantly higher than the median pay projected by the US Department of Labor Bureau of Labor Statistics, indicating that the cost could be lower depending on the salary agreed upon for the chiropractor's contract. Distributing the cost of the chiropractor's salary among students for a period of time would allow the university time to understand how its relationship with insurance companies would change and determine just how much they can receive back from insurance reimbursement. Because the Health Center currently bills to insurance and would already have the insurance information for students who have provided it, this transition to billing for chiropractic services would be relatively simple.

There is a need for increased access to chiropractic services among the college student population. College students experience a wide variety of medical ailments, such as neck and back pain and headaches, due to their unique circumstances; the stress of working toward a college degree, the use of backpacks and laptop computers, and even the academic program a

student chooses can increase the prevalence of these musculoskeletal conditions. Although research into this field is still developing, the conclusion has been formed several times that benefit can be found in chiropractic adjustments and that the benefits found outweigh the temporary minor risks and exceedingly rare severe risks. Further, chiropractic care is cost effective and consistently leaves patients satisfied with their care. Therefore, the integration of a chiropractor into the existing Student Health Center on the University of Northern Iowa's campus would be valuable to the student population to effectively help treat low back pain, neck pain, and headaches UNI students experience.

Conclusion

Chiropractic care is effective in reducing low back pain, neck pain, and headaches with temporary minor adverse effects and very rarely severe side effects. Because these health difficulties occur frequently in college students, the University of Northern Iowa should incorporate chiropractic medicine into the existing Student Health Center. Doing so would improve chiropractic access to over 11,000 UNI students at a minimal cost.

One limitation should be noted regarding the studies cited in this paper. A significant portion of the studies cited were conducted in countries other than the United States. The question may be asked as to whether these studies are applicable to different locations. Because of the relatively limited research conducted in the United States about chiropractic related concerns and the fact that these studies focused on overall health, such as low back and neck pain and headache, rather than logistic usage of chiropractic that would be expected to vary more by location, the studies were included. Future research in the United States concerning the prevalence of musculoskeletal health concerns among college students is needed. This is an avenue I plan to explore as a future chiropractor; I hope to continue my research at Palmer

College of Chiropractic and utilize my findings to help promote chiropractic care to a wider range of patients. Further research concerning these topics may also be utilized by chiropractors across the United States and the world to help improve the health of an incredible number of college students.

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