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The Interdisciplinary Treatment of Temporomandibular Disorder

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THE INTERDISCIPLINARY TREATMENT
OF
TEMPOROMANDIBULAR DISORDER

By

Wendy Conlon
Amy Jones
Brenda Mitus

THESIS

Submitted to the Department of Physical Therapy
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1997
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THE INTERDISCIPLINARY TREATMENT OF TEMPOROMANDIBULAR DISORDER

ABSTRACT

Temporomandibular disorder (TMD) is a chronic complex disorder that is treated by many health care professionals including dentists and physical therapists. The purpose of the study was to investigate the extent an interdisciplinary relationship exists between the dental and physical therapy professions in the treatment of TMD. This was accomplished by sending a survey questionnaire to 300 dentists in three midwestern metropolitan areas. The questionnaire identified treatment strategies and referral patterns used by dentists treating TMD. It is believed that the results of this study will bring attention to the advantages of using an interdisciplinary approach in the treatment of TMD.
ACKNOWLEDGMENTS

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DEFINITION OF TERMS


Biofeedback Training: therapy that teaches the voluntary modification of physiologic activity or autonomic function using equipment that gives a visual or auditory representation of the activity or function (Okeson, 1996, p 229).

Bruxism: nonfunctional grinding of the lower teeth against the upper teeth (Dawson, 1989).

Collaboration: diverse professionals share information, assessment, and treatment plans usually on a case-by-case basis; usually occurs informally over coffee or in routine case staffing (Huff, F. & Garrola, G., 1995).

Comprehensive History: includes the patient’s chief complaint, history of present complaint, past medical history, past dental history, review of systems, and psychosocial history (Okeson, 1996, p 19, and Tanaka, 1984).

Comprehensive quality care: an all inclusive, extensive approach that provides an excellent individualized health care plan.

Computed Tomography: a computerized tomographic imaging method that uses a narrow radiographic beam which passes through the tissues. The computer calculates tissue absorption with the film images reflecting the densities of various structures (Okeson, 1996, p 265).

Cranial Nerves: twelve pairs of nerves that have their origin in the brain (Okeson, 1996, p 234).

Disc Displacement with Reduction: abrupt alteration of the disc-condyle structural relation during mandibular translation with mouth opening and closing where, from the closed mouth position, the misaligned disc improves its structural relation with the condyle during mouth opening (Okeson, 1996, p 130).

Disc Displacement without Reduction: the misaligned disc is permanently displaced and does not improve its relation with the condyle on translation (Okeson, 1996, p 131).

Electromyography (EMG): graphic recording of the intrinsic change in the electric potentials of muscles (Okeson, 1996, p 238).

Fragmentation: to break into incomplete parts (Websters Dictionary)
Interdisciplinary education: World Health Organization defines as "the process by which a group of students (or workers) from the health-related occupations with different educational backgrounds learn together during certain periods of their education, with interaction as an important goal, to collaborate in providing promotive, preventative, curative, rehabilitative, and other health-related services."

Mandible: horseshoe-shaped lower jaw bone containing sockets for the lower teeth and coronoid and condylar processes which make up a portion of the TMJ (Okeson, 1996, p 246).

Metropolitan: the central city plus the adjacent densely populated areas that together have a minimum population of 50,000 (Grand Rapids Public Library: reference desk, April, 1996).

Muscles of Mastication: the muscles responsible for masticatory motion, including the paired masseter, temporalis, lateral pterygoid, and medial pterygoid (Okeson, 1996, p 246).

Muscle Splinting: reflexive contraction of adjacent muscles resulting from noxious stimuli to the joint, soft tissue, or other structures to prevent movement or provide stabilization of the painful area tissues (Okeson, 1996, p 257).

Occlusal Appliance: an intraoral device designed to fit over either the maxillary or mandibular teeth which provides an artificial occlusal surface (Okeson, 1996, p 244).

Oclusion: the static relationship between the masticating surfaces of the maxillary and mandibular teeth (Okeson, 1996, p 252).

Orofacial: relating to the mouth and face (Okeson, 1996, p 253).

Parafunctional Habits: teeth clenching, tooth grinding, lip biting, or abnormal posturing of the jaw (Okeson, 1996, p 121).

Range of Motion (ROM): the range through which the joint can move (Okeson, 1996, p 258).

Temporomandibular Joint: paired synovial joint capable of both gliding and hinge movements, articulating the mandibular condyle, articular disc, and squamous portion of the temporal bone (Okeson, 1996, p 264).

Ultrasound: sound waves beyond the upper frequency limit of the human ear (Okeson, 1996, p 266).
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CHAPTER ONE

INTRODUCTION

One of today's leading problems facing the health care system is fragmentation of services (Lynch, 1981). When health care professionals work in isolation, little or no communication occurs, whereby patient care is affected. In an attempt to alter this fragmentation, and therefore enhance patient care, an interdisciplinary team approach has been considered (Beatty, 1987).

The interdisciplinary team approach to patient care is a promising trend in health care. This approach is defined by Nowjack-Raymer (1995) as an approach involving health care providers from different disciplines cooperatively working together to maximize interaction and mutual learning and to meet common patient goals. Along with the term interdisciplinary, two other terms are used in association with team approaches; multidisciplinary and transdisciplinary. There is a lack of clarity among these differing terms' definitions due to improper usage of each term. For the purpose of this study, the term interdisciplinary will be used in conjunction with the definition provided by Nowjack-Raymer as it is the approach most utilized in health care settings (Harvan, 1993).

An interdisciplinary team approach provides the most comprehensive treatment planning and implementation of services for many patients and various diagnoses (Harvan, 1993). Patients with chronic complex disorders are considered promising candidates for interdisciplinary team care (Perkins & Tryssenaar, 1995; Huggare & Raustia, 1992 and Halstead, 1976). Perkins and Tryssenaar (1995) state that a single
health care professional or discipline can not have expert knowledge in all areas needed for treating complex disorders. Thus, the patient may not be provided with comprehensive quality care if treated by a single discipline.

The interdisciplinary team approach is used in many professional environments. Included among these are home health care (Green, et al, 1995), hospice (Frederich, 1989; Eng, 1993; and Ramsay, 1992), pediatrics (Rhodes, 1991), school systems (Rine and Toot, 1985, p 28), inpatient rehabilitation (Tuel, et al, 1992 and Erickson, et al, 1993), outpatient clinics (Makofsky, 1994), acute care hospitals (Carty & Day, 1993) and extended care facilities (Chiodo, Gerety, Mulrow, Rhodes & Tuley, 1993). It has been found that within these varied settings physical therapists are typically considered crucial team members (Carty & Day, 1993; Erickson, et al, 1993; Rhodes, 1991; Tuel et al, 1992; Chiodo, et al 1992). Physical therapists are also valued members of an interdisciplinary team in the treatment of many chronic complex disorders (Tuel, et al, 1992).

Temporomandibular disorder (TMD) is of a chronic complex disorder (Chiodo, et al, 1992) that can be successfully managed with an interdisciplinary team composed of a dentist and a physical therapist (Kraus, 1994; Danzig and VanDyke, 1983; Clark, Lanham, and Flack, 1988; Friedman and Weisberg, 1982; Solberg & Fricton, 1992; and McKinney & Mosby, 1990). TMD, as defined by the American Academy of Orofacial Pain, "is a collective term embracing a number of clinical problems that involve the masticatory musculature, the temporomandibular joint (TMJ) and associated structures, or both" (McNeil, 1993, p 11). Disorders of the TMJ are considered a subclassification of musculoskeletal disorders and have been identified as a major cause of nondental pain in the orofacial region (McNeil, 1993, p 11). These disorders are often accompanied by limitation or distortion of jaw movement, joint sounds, palpable muscle tenderness or joint soreness (Carlson, Moline, Huber, and Jacobson, 1993; Mohl, McCall, and Lund,1990). Patients suffering from TMD often complain of jaw ache, earache,
headache, and facial pain (McNeil, 1993, p 11). Other local musculoskeletal pain symptoms experienced by these patients include decreased range of motion of the jaw, muscular stiffness and pain, and degenerative osteoarthritic changes of the cervical spine (Rocabado, 1981, p 44).

Dentists are the primary healthcare professionals involved in treating the patient with TMD. Dentists primarily focus on assessment, diagnosis and treatment of teeth and the bony structure of the jaw and often are not conversant in the assessment of the musculoskeletal component of TMD. Physical therapists are educated to manage and have expertise in joint and soft tissue problems (Friedman and Weisberg, 1982) and are familiar with treating the musculoskeletal problems associated with TMD. An interdisciplinary team approach to the treatment of TMD including a dentist and a physical therapist would encompass both the occlusal and musculoskeletal components of TMD.

It is believed that a lack of an interdisciplinary team approach exists between dentists and physical therapists in the management of patients with TMD. The purpose of this study will be to investigate the current relationship between the dental and physical therapy professions regarding the cooperative treatment of TMD. The hypothesis of this investigation is that the majority of dental professionals do not refer their patients with TMD for physical therapy treatment. The significance of this study will be to bring attention to the degree of interaction that exists between dentists and physical therapists regarding TMD treatment. It is hoped that the study will also increase awareness of the benefits of physical therapy intervention to the dental community and to indirectly serve the TMD patient population with comprehensive quality care. It is the authors' intent to publish the results of this study to promote awareness to both professions.
CHAPTER TWO

LITERATURE REVIEW

The literature examined in this section provides a review of current literature regarding Temporomandibular Joint Dysfunction (TMD). The interdisciplinary literature incorporates review of interdisciplinary health care teams and the use of these teams in many professions. A summary of the interdisciplinary approach in health care which supports the need for an interdisciplinary approach between a dentist and a physical therapist in the treatment of TMD is included. Additional literature concerning dental and physical therapy management of patients with TMD, including evaluation and treatment procedures, is examined.

**Interdisciplinary Literature**

The three most common terms utilized are the multidisciplinary, interdisciplinary and transdisciplinary team approaches (Sheldon and Craig, 1994). A definition of each term is provided.

A *multidisciplinary* team approach refers to a structure of care in which each discipline performs its own assessment and devises individual goals. These goals are then implemented into the patients plan of care without collaboration among the other involved disciplines. Patient progress is addressed, however it is unlikely to be shared with the other treating disciplines (Sheldon and Craig, 1994).

The *interdisciplinary* team approach, emphasizes communication among involved disciplines and the creation of team-directed goals. Each discipline is aware of the
progress being made within the other disciplines. The patient is considered as the center
of treatment in order to create a patient-focused care plan (Sheldon and Craig, 1994).
Similarly, Nowjack-Raymer (1995) described the interdisciplinary team approach as one
that includes health care professionals from different disciplines cooperatively working
together to maximize interaction and mutual learning to meet common patient goals.

In comparison to interdisciplinary teams, the transdisciplinary team approach
addresses the overall functional outcome of shared team-directed goals as opposed to
being set between disciplines. The goals are set and reported cooperatively among the
disciplines as opposed to being set specifically within each discipline. Problem solving
takes place among the disciplines and the patient is a key team member. This
transdisciplinary team approach represents the most holistic patient care model available
(Sheldon and Craig, 1994) and is typically seen in the school setting.

Although the transdisciplinary team approach appears to be an ideal environment,
it was not focused on in this study for several reasons and beliefs. First, this approach is
basically practiced in the school setting. It is our understanding that it has not been seen
in the world of health care. Secondly, the dental profession in general was not believed to
be actively involved in team care, not even with a multidisciplinary perspective.
Therefore, a leap to the ideal transdisciplinary approach would not be reasonable at this
time. Finally, considering today's health care industry operates in either a
multidisciplinary or interdisciplinary environment, it would not be appropriate and/or fair
to expect a transdisciplinary environment within the dental profession.

A team approach is not a recent innovation in health care. The need for team
treatment was mentioned in 1922 by Barker (1922). According to Infante, Speranza and
Gillespie (1976), a team approach to health care has been recognized as the most
comprehensive health care delivery system since the late 1960's. Attempts have since
been made to initiate the development of an interdisciplinary health care system by the
federal government and private foundations (Huff and Garrola, 1995). Beatty (1987) indicated that in order for an interdisciplinary team to function optimally, the professionals involved need to be educated on how to effectively function as a member of an interdisciplinary team. Considering the above statements, and that a need for improvement in physical, psychological, social and occupational status is indicated for most diagnoses (Perkins and Tryssenaar, 1995), it is difficult to understand how so little development in the education of interdisciplinary team care for health professionals has occurred (Beatty, 1987).

Huff and Garrola (1995) state that collaboration is one of the key characteristics of interdisciplinary teams. The infrequency of health care professionals sharing resources and working as an interdisciplinary team has prevailed due to a competitive rather than a collaborative health care delivery system. Other barriers to the development of successful interdisciplinary team care were discovered by Moulder, Staal, & Grant (1988) during an assessment of their own interdisciplinary approach to rehabilitation. Their interdisciplinary team consisted of a physiatrist, nurse, physical therapist, occupational therapist, speech therapist, neuropsychologist, recreational therapist, social worker, dietitian and two additional caregivers. Among the problems mentioned were a lack of communication among team members regarding the patients, team leadership roles were not clearly defined, and frequent rotation of team members from team to team. Unfortunately, the specific frequency of team member rotations was not mentioned. The authors concluded that the above issues contributed to a lack of continuity of care and a diminished team morale.

Similarly, in studies by McPherson, Witteman, & Hasbrouck (1984) and Sheldon & Craig (1994) problems arose when professionals from varying disciplines were combined to work as a team. Problems specifically identified were differences in terminology, power struggles, ownership of specific tasks and differing, possibly
conflicting motives. McPherson et al (1984) noted that a group of physicians, nurses, pharmacists, allied health professionals, dentists, social workers and educational consultants at Ohio State University encountered these problems. However, a model for a successful interdisciplinary team was developed during the study. The first stage involved identifying interdependence. The team had to agree on common realistic goals, and on when it was appropriate to act together. The second stage involved "exploring the roles and sources of influence" to limit stereotyping of various professional roles. An acceptance and respect for every team members' knowledge and skill was crucial at this stage and when accomplished, created a more meaningful contribution to the team for quality patient care. The last stage involved the development of work methods to accomplish team goals. The team had to learn to work together toward a common goal. These stages were expected to be encountered in a cyclical manner. As the team grew together, the comfort levels of members improved. Central to success was constant re-evaluation of each stage by the group members.

Through the education of future and existing health care professionals, a way to change attitudes and build health care professionals' team skills has been addressed (Perkins et al, 1994). The expectation of this education was that by training students to work on interdisciplinary teams, improvement in the efficiency and effectiveness of health care delivery would occur (Huff et al, 1995 and Perkins et al, 1994). These programs should be considered as a beginning to solving the problem. The programs should provide health care students with the familiarity of other disciplines and an awareness of the importance of working as a team member (Huff et al, 1995). Additional support was required once the students entered the professional world in order to make the educational training worthwhile (Infante et al, 1976).

An interdisciplinary education course at the University of Connecticut was implemented across many of the health care curricula. The philosophies and effects of
the course were provided by Infante et al (1976). The schools that implemented an interdisciplinary course in their core curricula included allied health, nursing, pharmacy and social work. The premise on which the course was built was that by using common material for study among several health professions, a theoretical knowledge base which supported future cooperative efforts would be established. Efforts to implement interdisciplinary education would have ideally transformed clinical practice. Another part of the course was clinically based. The educators expected this would provide a way for the students to share clinical experiences and therefore learn to practice together. The course was intended to promote a basic knowledge of each profession that would develop an awareness for the contributions of others. The students’ course evaluations indicated that the majority enjoyed and benefited from the course (Infante et al, 1976).

A similar view by McKiel, Lockyer, & Pechiulis (1988), suggested that the best time to incorporate the team was after the students had been able to develop a professional identity. It was suggested that an appropriate time would be during the students’ senior year or after graduation through continuing education. A study was conducted with rehabilitation students already possessing an undergraduate degree from the schools of physical therapy and occupational therapy at McMaster University in Canada (Perkins et al, 1994). The students evaluated individual and group performances after taking interdisciplinary courses. Both groups of students indicated that they thought positively of the interdisciplinary courses and their effect. This evaluation process indicated that each group had an inadequate understanding of the other’s professional roles. All the students reported an increased knowledge base of the other profession and a desire to cooperate in practice after taking the course. The inclusion of physical and occupational therapy students in this academic program with an interdisciplinary course was believed to assist these students in the transition from student to professional (Perkins et al, 1994).
A benefit of interdisciplinary team care is the potential for a decrease in the length of hospital stay (Carty, 1993; Connelly, 1996; Perkins et al, 1994). Considering today's increasing cost of hospitalization and diagnoses related group (DRG) constraints, the development of programs which support decreasing the client's length of hospitalization is crucial (Perkins et al, 1994).

Results from a six month period were collected by Erickson and Perkins (1993) on the effect of interdisciplinary teams in the management of hip and knee arthroplasties at their outpatient rehabilitation center. The results indicated a decrease in length of hospital stay by 3.95 days for knee arthroplasties and 4.95 days for hips. The team consisted of physical therapists, occupational therapists and two nurses. With the interdisciplinary model, maximal functional outcomes were obtained.

A case report, using an interdisciplinary model, regarding management of patients with a hemicorporectomy after a spinal cord injury using an interdisciplinary model was described by Tuel, Cross, Meythaler, Faisant, Krajnik, Hogan, Sewell, Wilson, Rodwell, & Smith (1992). The team consisted of health care professionals from physical therapy, occupational therapy, rehabilitation nursing, therapeutic recreation, social work, vocational rehabilitation, and psychiatry in an inpatient rehabilitation setting. It was found that extensive interdisciplinary team care was needed for this population as the surgery was more devastating than the original spinal cord injury. The interdisciplinary team approach allowed for the delivery of comprehensive care according to Tuel et al (1992).

According to Rhodes (1991) patients with juvenile rheumatoid arthritis (JRA), a major cause of childhood disability, were also thought to benefit from an interdisciplinary treatment approach. The cause of JRA is unknown, although it is thought that it has a multifactorial etiology. Therefore, the benefits of an interdisciplinary team were indicated to approach the treatment of multiple systems by employing the skills of several disciplines. Among the members of this team was the outpatient physical therapist.
Other disciplines working with the physical therapists may include pediatric rheumatologists, cardiologists, occupational therapists, nurses, social workers, psychologists, ophthalmologists, orthopedists, orthotists and dietitians. Many of the team members worked jointly toward common goals both prior to and after surgeries to provide comprehensive quality care. Rhodes (1991) believed that without the help of all the team members, a high level of care could not have been obtained.

A project was developed in an acute care hospital by Carty & Day (1993) to look at the effects of an interdisciplinary team. The team members included medical staff, physical therapists, dietitians, social workers and pharmacists. The population consisted of geriatric patients in a senior care unit. It was concluded that the interdisciplinary team approach provided a more complete and better quality care plan, increased the knowledge of each other's areas of expertise and provided quality care without increasing the length of stay or hospital costs. Similarly, Erickson and Perkins (1993) concluded that their utilization of an interdisciplinary team for patients with knee and hip arthroplasty resulted in a decrease in average length of stay and hospital cost.

The utilization of physical therapists on interdisciplinary teams has been indicated as beneficial when dealing with varied patient populations, such as pediatrics, geriatrics, chronic pain patients, patients with spinal cord injuries and orthopedic patients. The physical therapist was also utilized in various environments, on an interdisciplinary team, including nursing homes, rehabilitation centers, acute care hospitals and orthopedic clinics.

Patients suffering from temporomandibular disorders (TMD) may benefit from an interdisciplinary team that utilizes physical therapists. TMD is an orthopedic disorder embracing a number of clinical problems that involve the masticatory muscles, the temporomandibular joint or both (Okeson, 1996, p 264). The dentist is typically
considered the primary professional in regards to TMD treatment (Friedman, & Wiesberg, 1982).

The history of treatment received by patients with TMD was investigated on 257 patients from a facial pain center at the University of Missouri-Kansas City. A few referral patterns surfaced during this investigation, however there was no mention of physical therapy treatment (Glaros, Glass, & Hayden, 1995). It was found that physicians and dentists saw patients with TMD and that they tended to refer patients only within their own professional discipline. This referral scheme occurred several times before referral to a specialized clinic. Such a clinic may have incorporated other health care disciplines. This indicated a potential for increased costs for the patient and a decreased chance of receiving comprehensive care from an interdisciplinary approach (Glaros et al, 1995).

Nowjack-Raymer (1995) mentioned the need for an interdisciplinary team approach in the management of ‘oral disease’. It was suggested that an interdisciplinary team approach provided the best chance of prevention of oral dysfunction. This recent report indicated that team development has been incorporated into the dental profession for decades but explained that there had been little development in integrating oral health into the area of general health. Thus, inclusion of dentists into interdisciplinary teams continued to be a problem. It was indicated that a probable solution is to incorporate interdisciplinary team concepts at pre-professional (Nowjack-Raymer, 1995) and/or post-professional levels of education (Nowjack-Raymer, 1995 and McKiel et al, 1988).

As mentioned in previously cited literature, an effective method for incorporating interdisciplinary care clinically is through the introduction of interdisciplinary concepts during the education of health care students. Attanasio & Mohl (1992) provided course suggestions for the specific development of a TMD and orofacial pain in predoctoral programs. There was no mention of incorporating physical therapists into the TMD
interdisciplinary team. However, there was indication for a multidisciplinary approach among the fields of medicine, dentistry and psychology. Hampf (1992) and Huggare & Raustia (1992) similarly indicate that a multidisciplinary approach was the most useful method in treating patients with TMD.

McKinney & Mosby (1990) discussed the need for dental students to be able to interact with various health care professionals within the medical and/or dental professions in order to deliver quality care for patients with TMD. These authors did mention physical therapy as a possible health care provider to be included within the treatment of TMD. Although an interdisciplinary team approach to TMD treatment was not specifically mentioned, it appeared to be a realistic projection.

McKinney & Mosby (1990) stated that there was a "void in dental education," at the predoctoral, graduate or residency program levels, in regards to the actual diagnosis, treatment and management of TMD. Most dental students were not exposed to the concept of having a patient with a chronic disorder that may need a lifelong management plan. The report focused on the need to educate dental students with regard to patients with TMD and the use of multiple disciplines. Multiple disciplinary treatment was indicated in order to treat the many systems involved in the dysfunction. These authors indicated the need for cooperation among various disciplines for successful treatment of TMD, one of which was physical therapy.

Solberg & Fricton (1992) stated that physical therapists were needed as full-time interdisciplinary team members due to their understanding of TMD etiology. They also acknowledged the existence of inadequate dental education related to TMD. Traditional education of dentists was found to emphasize acute pain versus chronic pain, isolated versus integrated management, technical skills versus clinical judgment and surgical procedures versus cognitive assessment. They suggested that the dental profession can not successfully develop a treatment protocol alone considering the chronic complex
condition involved. It is believed that TMD has a multifactorial etiology and/or symptomology which is best treated by several disciplines within an interdisciplinary team (Solberg & Fricton, 1992).

A common and needed ingredient of an interdisciplinary team is cooperation (McPherson et al, 1984 and Huff et al, 1995). The literature indicates that physical therapy is considered to be a valuable cooperative adjunct in the treatment of patients with TMD (Danzig & VanDyke, 1983; Rocabado, Johnston & Blakney, 1983; Friedman et al, 1982; Nowjack-Raymer, 1995; McKinney et al, 1990; Solberg et al, 1992; and Okeson, 1996, p 200). However, the literature indicates a failure in incorporating physical therapists as members of today’s interdisciplinary teams treating patients with TM disorders. No reasoning was indicated for this failure. (McKinney et al, 1990; Nowjack-Raymer, 1995; Okeson, 1996, p. 143; and Solberg, 1992).

As previously described, an interdisciplinary approach to the management of TMD is considered to be comprehensive treatment. The cooperation of dentists working with physical therapists in treating TMD leads to successful management of the disorder (Danzig & VanDyke, 1983; Rocabado, Johnston & Blakney, 1983; Friedman et al, 1982; Nowjack-Raymer, 1995; McKinney et al, 1990; Solberg et al, 1992; and Okeson, 1996, p 200). The following is a review of dental and physical therapy management of TMD.

**Dental Assessment of TMD**

There are numerous local and systemic disorders that may cause a patient to have TMD symptoms or that may exacerbate TMD symptoms (Wright, 1992), making TMD difficult to diagnose. For this reason, a thorough dental assessment of the temporomandibular joint (TMJ) and associated structures is critical. The dental assessment begins with an extensive knowledge and understanding of the patients complaints on the part of the dentist. It is important that, at the initial visit, the dentist...
attempt to establish an open rapport with the patient. This will allow the patient to feel at ease and more eager to disclose valuable information regarding his/her disorder. A screening evaluation is used as part of the dental assessment to obtain knowledge of the current signs and symptoms the patient is experiencing associated with the TMD (Okeson, 1996, p 19). Included in the screening evaluation are a questionnaire pertaining to a pain scale, a comprehensive history, and the actual physical exam (Okeson, 1996, p 19; and Tanaka, 1984). The evaluation may also include radiographic studies or soft tissue imaging of the TMJ and associated structures, and possibly a behavioral and psychosocial assessment (Okeson, 1996, p 21).

The comprehensive physical examination includes observation and palpation of the TMJ, general examination of the head and neck, detailed evaluation of the muscles of mastication, a neurologic screening exam, assessment of TMJ range of motion (ROM), and a detailed intraoral examination (Okeson, 1996, p 23). The findings from the physical exam may direct the dentist to a further investigation of the structural components of the joint through radiographic imaging. According to Okeson (1996), "imaging is used to confirm the presence of suspected pathology, to screen for unsuspected pathology, to identify staging of a disease, and sometimes to evaluate the effects of a given treatment" (p 32). The dentist compiles the data from the screening process to determine the best treatment option for the patient with TMD.

**Dental Treatment of TMD**

The management goals for the treatment of TMD from a dental perspective include, pain reduction, a decrease in adverse loading of the jaw, restoration of function, and resumption of normal daily activities (Okeson, 1996, p 141). The dental profession, as a whole, is divided over how TMD should be conceptualized, diagnosed, and treated (Glass, Glaros, & McGlynn, 1993), but agreement does exist that conservative methods
should be a basic treatment principle in TMD (Dahlstrom, 1992). According to Okeson (1996), special effort should be made in the care of patients with TMD to avoid early use of aggressive, irreversible treatments (p 142). The principle behind conservative treatment methods for TMD is preserving and maintaining normal function while reducing the patients pain (Dahlstrom, 1992).

Treatment strategies utilized by the dental profession include patient education and self care, pharmacotherapy, orthopedic appliances, occlusal therapy, physical therapy and surgery (Okeson, 1996, p 143). Of the above, the conservative treatment options will be addressed for this literature review. According to Dahlstrom (1992), no particular conservative treatment method appears to be superior to another, and when several conservative treatment methods are combined, many patients are successfully treated (Greene & Laskin, 1983).

Patient Education and Self Care

Education of patients regarding their diagnosis and disorder is an important component in the treatment of TMD (Okeson, 1996, p 141). An educated patient has a greater likelihood of demonstrating motivation, cooperation, and compliance with treatment which leads to a successful self care program and management of TMD. To facilitate patient education, the dentist must create an environment in which the patient is at ease and can be receptive to learning. The dentist must be an attentive listener and must take the time to explain the clinical findings, diagnostic data, treatment options, and prognosis to the patient in terminology the patient is able to understand. These factors lead to the development of a high level of rapport between the dentist and the patient which also may increase the success of treatment (Okeson, 1996, p 143).

Subsequent to the dentist educating his/her patient regarding TMD, a self-care home program can be initiated. The purpose of the self-care home program is to allow
healing to occur and to prevent further injury to the musculoskeletal system. Often, the initiation of a self care program is enough to manage TMD. The program would include, rest of the masticatory system by limiting mandibular function, patient habit awareness and modification, and a home exercise program for the TMJ. Limitation of mandibular function to allow the affected musculature of the TMJ to rest would include avoidance of heavy mastication, excessive gum chewing, wide yawning, and singing. Patient habits that should be modified to manage TMD include avoidance of teeth clenching, bruxing, tongue thrusting, object and cheek biting, and poor sleeping posture (Okeson, 1996, p 143). Failure to identify and address the above mentioned activities may contribute to TMD. Patient education to avoid these is important.

The emphasis in instruction of a home exercise program, from a dental perspective, is patient self control (Okeson, 1996, p 143-144). A dental home exercise program includes a program of moist heat and/or ice to the affected areas (Clark, Seligman, & Pullinger, 1990; Glass et al, 1992; and Okeson, 1996, p 143-144). Heat application would consist of superficial heating used to stimulate muscle relaxation and vascular perfusion. Heat can be applied using moist towels heated in the microwave oven, moist heating pads, or disposable hot packs. The application of heat is contraindicated for an acute injury (less than 72 hours), acute inflammation, or infection associated with TMD (Okeson, 1996, p 143-144). A cold compress is primarily used for local analgesic and anti-inflammatory effects in muscle and joint tissues related to the TMJ, and should be applied directly over the muscle fibers and joint itself. The application of a cold compress is contraindicated over areas with poor circulation and over open wounds. Also incorporated into a dental home exercise program are self massage to the affected muscles and gentle range of motion (ROM) exercises to decrease tenderness and pain and to increase ROM of the TMJ (Okeson, 1996, p 143-144).
Pharmacotherapy

Pharmacologic agents are used by dental professionals to promote patient comfort and rehabilitation by decreasing pain and dysfunction (Dahlstrom, 1992; Glass et al, 1993; and Okeson, 1996, p 145). Okeson (1996) states that no one drug has proven to be effective for the entire spectrum of TMD symptoms (p 145), therefore pharmacologic agents should be used as part of a comprehensive treatment program (Dahlstrom, 1992 and Okeson, 1996, p 145). The most effective agents for the management of TMD include, analgesics, nonsteroidal anti-inflammatory drugs (NSAIDS), corticosteroids, anxiolytics, muscle relaxants, and low dose antidepressants (Dahlstrom, 1992 and Okeson, 1996, p 145). The analgesics, corticosteroids, and anxiolytics are indicated for acute TMD pain, but the most useful agents, only in short-term acute pain conditions, are analgesic opioid narcotics. The use of opioid narcotics must be monitored, as they produce tolerance and dependence due to their central nervous system depression qualities and addiction liabilities. Nonopiate analgesics are effective for mild to moderate pain associated with TMD. Salicylates (aspirin) are a class of nonopiate analgesics which act primarily as antipyretics, analgesics, and anti-inflammatories (Okeson, 1996, p 145). These anti-inflammatory agents are indicated if TMD pain is capsular in origin (Dahlstrom, 1992). Corticosteroids are potent anti-inflammatory agents which, according to Okeson (1996), are not commonly prescribed for systemic use in the treatment of TMD (p 146). Intra-articular, or intracapsular TMJ injection of corticosteroids is used, on a limited basis, with positive effects in cases of acute flare up of severe joint pain and dysfunction localized to the TMJ (Dahlstrom, 1992 and Okeson, 1996, p146). Anxiolytic agents can be useful in the management of acute systems related to anxiety and nocturnal bruxism, but their addictive potential and sedating effects are contraindicated for long-term use (Okeson, 1996, p 146). Anxiolytics include: Benzodiazepines which are anti-anxiety agents prescribed for acute exacerbations of masticatory muscle pain; Diazepam
(Valium) prescribed to reduce nocturnal bruxism; and clonazepam (Klonopin) prescribed to reduce secondary myofascial pain symptoms in patients with TMD (Dahlstrom, 1992; and Okeson, 1996, p 146).

The NSAIDs and muscle relaxant agents may be used for both acute and chronic conditions (Clark et al, 1990; and Okeson, 1996, p 145). Non-steroidal anti-inflammatory drugs (NSAIDs) are effective for mild to moderate inflammatory conditions and for acute post-operative pain. These drugs are specific to musculoskeletal pain and provide only symptomatic relief, not preventing the progression of the pathologic tissue injury (Okeson, 1996, p 146). Muscle relaxant agents are prescribed to prevent increased muscle activity associated with TMD (Dahlstrom, 1992; and Okeson, 1996, p 146). The mechanism of these agents is to depress spinal polysynaptic reflexes and affect neural activity associated with muscle stretch reflexes, primarily in the lateral reticular area of the brainstem. Mephenesin is the prototype for the majority of the oral skeletal muscle relaxants which include the propanediols, methocarbamol, and chemically related chlorozoxazone (Okeson, 1996, p 146).

The tricyclic antidepressants are primarily indicated for chronic orofascial pain management (Okeson, 1996, p 145). The anti-depressant agents have analgesic properties independent of the anti-depressant effect and are prescribed for patients with chronic pain, depression, and sleep disturbances associated with TMD. To elicit the analgesic effects of these drugs, dentists must prescribe low doses of this drug class (Okeson, 1996, p 147).

Occlusal Appliances

Another form of conservative treatment for TMD is the use of occlusal appliance therapy. Occlusal appliances, also referred to as interocclusal splints, orthopedic appliance, orthotics, bite guards, bite planes or bruxism appliances, are commonly used in
the treatment of TMD (Dahlstrom, 1992; Glass et al, 1993; Clark et al, 1990; and Okeson, 1996, p 150). Occlusal appliances are removable, acrylic devices that cover the teeth and are used to alter occlusal relationships and to redistribute occlusal forces (Okeson, 1996, p 150). These appliances also prevent wear and mobility of the teeth, reduce bruxism and parafunction, and are used to treat masticatory muscle pain and dysfunction associated with TMD (Carlson, Moline, Huber, & Jacobson, 1993; Clark et al, 1990; Dahlstrom, 1992; and Okeson, 1996, p 150). The occlusal devices also serve to alter the structural relationships in the TMJ (Okeson, 1996, p 150), although, according to Clark et al (1990), the return of TMD symptoms may not be prevented by occlusal splint therapy alone. According to Okeson (1996), the two most commonly used appliances in the treatment of TMD are stabilization appliances and anterior positioning splints (p 150).

Stabilization appliances cover all of the maxillary or mandibular teeth and are intended to provide joint stabilization, protect the teeth, redistribute forces, relax the muscles that elevate the jaw, and to decrease bruxism (Okeson, 1996, p 150; Greene & Laskin, 1972; and Carraro, Odont, & Caffesse, 1978). This appliance serves to alter the rest position of the mandible to a more relaxed, open position. In acute cases, the appliance can be worn full time, but as symptom reduction occurs, use of the appliance at night only is preferred to avoid dependence. Eventually, intermittent use of the appliance at night during periods of increased stressful life events is the goal. Okeson (1996) recommends a trial time of 3-4 weeks of wearing the appliance (p 150). Following this time, patients showing no positive resolution of their symptoms should be re-evaluated for other factors such as chronic pain behavior, noncompliance, or misdiagnosis of TMD. If the stabilization appliance is an effective treatment method for the patient with TMD, it should be adjusted periodically to compensate for changes in the maxillomandibular relationship as pain, muscle activity, inflammation, edema, and soft tissue structural relations change (Okeson, 1996, p 150-151).
Anterior positioning splints, also referred to as anterior positioning appliances or mandibular orthopedic repositioning appliances, are used to decrease joint pain, joint noise, and associated muscle symptoms in TMD (Okeson, 1996, p 151). According to Okeson (1996), anterior positioning appliances affect the joint in three ways: (1) they may alter adverse loading in the joint; (2) they may alter the structural condyle-disc relationship; and (3) they may reduce muscle splinting (p 151). The primary indication for an anterior positioning appliance is acute joint pain associated with disc displacement with reduction. The appliance is most effective when initially worn full-time, but as symptoms resolve, part-time use is encouraged (Okeson, 1996, p 151-152). The anterior positioning splint has not been found to establish a new occlusal position with repositioning of the disc in long-term use (Okeson, 1996, p 152; and Orenstein, 1993).

Caution must be used when treating TMD with occlusal appliance therapy. Complications that can occur with excessive or incorrect use of an occlusal appliance include, gingival inflammation, mouth odors, speech difficulties, occlusal changes, and psychological dependency on the device (Okeson, 1996, p 150). Dentists are also cautioned that primary occlusal therapy for the treatment of TMD should be monitored, as there is "no clear evidence that natural occlusal morphologic variation is a common cause of TMD" (Okeson, 1996, p 153). Although occlusal dental treatment may be necessary for patients with TMD, it is occasionally necessary for the purpose of direct treatment of TMD. Okeson (1996) suggests that part-time use of the anterior positioning appliance or use of a stabilization appliance, with adjunctive therapy for pain relief and improved function are the most effective treatment options for TMD (p 152-153). A multidisciplinary treatment approach to TMD would be intended to facilitate control of symptoms (Okeson, 1996, p 143).
Surgical Treatment

TMJ surgery is an effective treatment for specific articular disorders but should be used as a last resort of treatment after nonsurgical conservative treatments for TMD have been exhausted. Many factors are investigated when considering surgical treatment including, anatomic derangement present within the joint, the potential for repair of the joint, the outcome of nonsurgical treatment, and the extent to which the problem affects the patients daily activities (Okeson, 1996, p 155-156).

The following criteria adapted from The American Association of Oral and Maxillofacial Surgeons, should be met before proceeding with TMJ surgery: (1) documented TMJ internal derangement or other structural disorder with appropriate imaging; (2) positive evidence to suggest that the symptoms and objective findings are a result of a structural disorder; (3) pain and/or dysfunction of such magnitude as to constitute a disability to the patient; (4) prior unsuccessful nonsurgical treatment; (5) prior management (to the extent possible) of bruxism, oral parafunctional habits, concurrent active medical or dental problems, and other contributing factors that may affect the surgical outcome; and (6) patient consent after a discussion of potential complications, goals, success rate, timing, postoperative management, and alternative approaches including no treatment (Okeson, 1996, p 156).

Surgical management of TMD may include arthrocentesis, arthroscopy, and/or arthrotomy. Arthrocentesis is an irrigation or lavage of the TMJ and may be used in conjunction with joint mobilization for effective treatment of TMD resulting from internal derangement without reduction. Arthroscopy is a closed surgical procedure which allows direct observation and sampling of joint tissues and may also be used for TMD resulting from a nonreducing displaced disc (Okeson, 1996, p 156). Arthroscopy is primarily performed in the upper joint space and is useful for minor joint debridement, lysis of adhesions, biopsies of intracapsular tissue (Okeson, 1996, p 156), and injection of
steroids (Peterson, Eriksson & Lundh, 1994). "A high success rate has been reported for arthroscopic surgery of displaced TMJ discs with respect to pain relief and increased mouth-opening capacity" (Peterson et al, 1994). Arthrotomy is an open surgical procedure of the TMJ that is used for patients with bony or fibrous ankylosis, neoplasia, severe chronic joint dislocations, painful disc derangement, and severe osteoarthritis (Okeson, 1996, p 157). Arthrotomy is indicated if arthroscopy has failed to resolve the patients TMD symptoms (Okeson, 1996, p 157).

Physical Therapy Assessment of TMD

An accurate physical therapy assessment of patients presenting with various signs and symptoms of TMD is essential to a successful treatment outcome. This is especially true when pain is the primary presenting complaint. Familiarity with the many head and neck entities is an important factor in appropriate diagnosis and treatment (Kraus 1994). Many of the same components of a physical examination used by physical therapists to assess any musculoskeletal disorder, apply to and are used in, a comprehensive assessment of the patient with TMD (Hertling and Kessler, 1990, p 441-444).

History

A complete patient history includes the following information: 1) chief complaint and general history of the complaint; 2) dental and medical history; 3) previous medical consultation and associated treatment; 4) history of trauma; 5) symptoms associated with the ears, head, neck or other related symptoms; 6) history of habits such as grinding, clenching, pipe chewing or singing; and 7) job related activities (Friedman and Weisberg, 1982; Kraus 1994, p 74-80; Hertling and Kessler, 1990, p 441-442).
Physical Examination

The components of the physical examination are observation, inspection, selective tissue tension tests, and palpation. Focus is also centered on general appearance, posture, and characteristics of bodily movements which are often revealing of TMD problems. Often the patient with TMD presents with a posture exhibiting a forward head, elevated shoulders, and a stiff neck and/or back. The patient may also have shallow, restricted breathing (Hertling and Kessler, 1990, p 442-445). The face should be checked for asymmetry, a short upper lip, and signs of soft tissue stress such as swelling should be noted. Tongue position and function are also evaluated (Friedman and Weisberg, 1982; Hertling and Kessler, 1990, p 442-445).

The general pattern of active movement (elevation, depression, lateral deviation, protraction, retraction) of the mandible is checked for freedom of movement, pain, range, and symmetry. Rocabado (1979) suggests that a normal amount of jaw opening is measured by the patient's ability to insert two of his knuckles (or slightly more) between his jaws when the mouth is opened maximally. If limitation is present it should be carefully measured so that improvement can be documented accurately. The restriction of lateral movement and asynchronous patterns of movement are recorded (Friedman and Weisberg, 1982; Hertling and Kessler, 1990, p 443).

The muscles of mastication should be tested for symptoms of pain or weakness. Resistive opening should be tested to identify dysfunction of the digastric and lateral pterygoid muscles. Resistive closing identifies dysfunction of the masseter, temporal, and medial pterygoid muscles (Rocabado, 1979).

Palpation of the muscles of the head and neck should be performed to determine the consistency, mobility, continuity, tenderness, pain, and signs of spasm in the musculature. The skin should be palpated for signs of warmth, tenderness, moisture, and mobility (Hertling and Kessler, 1990, p 443; Schwartz, 1959). "Palpation of the lateral
and posterior aspects of the TMJ is important in determining the existence of capsular inflammation (Friedman and Weisberg, 1982)."

The TMJs are evaluated for passive joint-play movements. "Downward and lateral mobilization of the condyle is performed gently to assess the amount of TMJ play. The patient must be relaxed, and this portion of the evaluation should be terminated if pain is produced (Friedman and Weisberg, 1982)."

A cervical examination is also included in the TMD assessment, as patients with TMD often complain of neck pain. Active and passive range of motion tests, muscle group strength tests, and palpation should be performed when cervical dysfunction is suspected (Kraus, 1994, p 89-90; Friedman and Weisberg, 1982).

**Physical Therapy Treatment of TMD**

Physical therapy management of TMD provides a therapeutic, conservative, cost-effective approach (Kraus, 1994, p 161). The goal of physical therapy in the treatment of musculoskeletal dysfunction is to relieve pain and restore function by reducing inflammation; altering muscle activity; and promoting the repair and regeneration of tissues (Okeson, 1996, p 147). Physical therapists use a variety of approaches in the management of TMD depending on the cause of dysfunction and the associated symptoms (Kisner and Colby 1990, p 495-497).

*Posture training*

Maintaining good posture will contribute to the well-being of the individual. Postural faults that persist can lead to pain or disability. The degree of discomfort and disability is related to the severity and persistence of the faults (Kendall, McCreary, and Provance, 1993, p 3-4). "The goal of posture training involves the prevention of untoward muscle activity of the head, neck, and shoulder musculature, as well as the
masticatory and tongue muscles (Okeson, 1996, p. 147)." A close interrelationship between the masticatory muscle system and the muscles supporting the head has been identified by Huggare and Raustia (1992). Forward head posture causes retraction of the mandible and resulting stretch on the anterior throat muscles. This leads to increased muscle activity in the muscles that close the jaw to counter the changed forces. The muscles and soft tissue in the suboccipital region become tight with resultant compression or irritation of the nerves and joints (Kisner and Colby, 1990, p. 495-497).

**Physical Agents or Modalities**

Physical therapists use various treatment modalities to manage pain, inflammation and loss of musculoskeletal function. Continuous ultrasound is used to stimulate the circulatory system, decrease inflammation, provide deep heating effects, and increase elasticity in tendon, capsule, and muscle tissue (Danzig and VanDyke, 1983). The high-frequency oscillations of the transducer head are converted to heat when transmitted through the tissue and can heat tissues to a depth of five centimeters (Ziskin, McDiarmid, Michlovitz, 1990). Continuous ultrasound delivered at 1 MHz to the TMJ at 1.0-1.25 W/cm squared using a 2 cm soundhead for 3 minutes is a protocol that is tolerated well by most patients as evidenced in a study conducted by Waide, Montana, Bade, and Diml troff (1992). Kraus (1994, p. 172 & 285) recommends the use of low-intensity pulsed ultrasound to treat acute inflammation. The non-thermal effects provide a physiologic action of fluid movement along cell membranes by mechanical pressure of the ultrasound wave, which will enhance the healing process. Treatment parameters are delivered at 3 MHz at 0.5-0.8 W/cm squared using a soundhead of 5 cm or less for 3 minutes.

Electrotherapeutic devices are used by physical therapists to produce thermal, histochemical, and physiologic changes in the tissues. These devices include
transcutaneous electrical nerve stimulation (TENS), and electrogalvanic stimulation (EGS) (Okeson, 1996, p 148-149). A TENS unit uses a low-voltage, low-amperage, biphasic current of varied frequency and is designed primarily for sensory counterstimulation in painful disorders (Moystad, Krogstad, and Larheim, 1990). EGS uses a high-voltage, low-amperage, monophasic current of varied frequency to produce a reduction of muscle pain and enhance healing by increased circulatory effects (Okeson, 1996, p 148-149).

Chronic spasm in the muscles of the TMJ can cause pain and dysfunction. Moist hot packs are frequently used for the treatment of subacute and chronic inflammatory conditions (Scully & Barnes, 1989, p 865). Hot packs applied to the cervical and masticatory muscles for 15-20 minutes may help to reduce pain through a general relaxation of tight muscles that are in spasm (Danzig & Van Dyke, 1983).

Cryotherapy is a common treatment for inflammation, acute or subacute trauma, edema reduction, or pain reduction. Application of an ice pack to the TMJ for 10-20 minutes may help to reduce pain and inflammation. Ice massage is another technique used to decrease symptoms in a localized area. The ice massage is performed for 5-10 minutes making small overlapping circles in an area of 10 by 15 cm (Scully & Barnes, 1989, p 869; Danzig & Van Dyke, 1983).

**Exercise**

"Clinical experience suggests that an active exercise program is important to the development and maintenance of normal muscle and joint comfort, function, and stability" (Okeson 1996, p 148). The goal of therapeutic exercise is to stretch and relax muscles, increase joint range of motion (ROM), increase muscle strength, reduce joint clicking, improve and maintain good posture, and stabilize the TMJs. The types of exercise regimes generally recommended are the following: isotonic exercises to increase
ROM and reduce joint clicking; isometric exercises to increase muscular strength and muscle reeducation; and passive and active stretching to increase ROM (Au and Klineberg, 1993; Danzig and VanDyke, 1983; Schultz and Mestrom, 1996; Santiesteban, 1989).

*Mobilization*

Joint mobilization techniques are indicated for decreased ROM, pain due to muscle contracture, disc displacement, and fibrous adhesions in the joint. Repeated manipulation by the physical therapist may help to restore a more physiologic resting muscle length and improve joint function. Often muscle relaxation and pain reduction are necessary to enhance the effect of mobilization (Okeson, 1996, p 148). "Passive intraoral joint mobilization techniques will be those techniques applied to the TMJ to address specifically the restoration of the passive accessory movements of distraction, translation, and lateral glide" (Kraus, 1994, p 193). Distraction refers to a force applied parallel to the longitudinal axis of the mandible. Kraus describes three stages of distraction ranging from a small amount of movement to moving into the limits of the restricted tissue. Translation describes a mobilizing force that will translate the condyle in an anterior direction and should be performed in the presence of distraction. Distraction and translation are mobilizing exercises used for periarticular tissue tightness or acute disc displacement without reduction. Intraoral lateral glide is performed with the clinicians thumb positioned on the top/inside of the mandibular molars to apply a lateral force. This is also used to treat periarticular tissue tightness (Kraus, 1994, p 193-196).

*Home Program*

Patients should be given a program to follow at home to aid in reducing their TMD symptoms. The home program would include any or all of the following: hot showers three times a day; use of warm compresses; soft diet; checking and maintenance
of proper mouth posture; ice massage to painful areas; active and passive exercises; massage to painful muscles; use of proper pillow for resting; and avoidance of strenuous activities (Danzig and VanDyke, 1983).

Electromyographic Biofeedback

"Muscle hyperactivity, spasm, and imbalance have been suggested in the dental literature for many years as a major feature of TMD patients, but evidence to support such concepts is lacking (Kraus, 1994, p 104)." Electromyographic biofeedback (EMGBF) therapy uses equipment to measure muscle activity. The goal of EMGBF is either enhancement or reduction of EMG activity. Before EMGBF training can be effectively used in a treatment plan, a thorough evaluation of the patient's particular disability must be completed. EMGBF therapy provides very specific and immediate information concerning muscle activity so it is important that the clinician define exactly the goal that is to be achieved (Gersh, 1992, p 296). Studies have shown that relaxation training with or without the use of surface EMGBF, can decrease tonic muscle activity (Mealicca and McGlynn, 1987, p 123-151).

Conclusion

As noted in the interdisciplinary literature, it appears that an interdisciplinary perspective is successfully used in many settings and is a health care trend of today. It was also found that physical therapists and dentists both have a significant role as members of an interdisciplinary team in the evaluation, treatment, and management of TMD. Also, the relationship between physical therapists and dentists in the management of TMD is supported in the literature as being beneficial.
CHAPTER THREE

METHODOLOGY

The study design included a survey questionnaire targeting dentists in three midwestern metropolitan areas of the United States with populations greater than 400,000 ("target population"). The cities randomly chosen for survey were: Columbus, Ohio; Milwaukee, Wisconsin; and Minneapolis, Minnesota. Subjects were sent a questionnaire by mail regarding their current treatment method for TMD. A small sample (9 dentists) of the target population voluntarily participated in a follow-up interview. The interview questions were derived from the survey questionnaire.

Subjects

All subjects were licensed dental practitioners who were actively engaged in patient care. One hundred randomly selected dental practitioners in each of the three cities were sent surveys during the summer and fall of 1996.

Instruments

A mail survey was used to identify the treatment strategies used in patient care of TMD by the target population. The survey was a closed-ended question format and contained twelve items. The survey also asked for permission to follow-up with a telephone interview.

The questionnaire was generated from contacts with physical therapists, dentists, our own experience and various literature sources. The reliability and validity of the questionnaire was enhanced through the use of a pilot-test in which a sample
questionnaire was administered to twenty dentists in a similar demographic area. Questions that provided difficulty in the pilot-test were revised or eliminated from the questionnaire. A factor that further enhanced the reliability and validity of the study was that the sample population included subjects from three different states who practice in large cities within the midwestern region of the United States. To provide further validity, the quantitative aspect of the study was followed by a qualitative perspective gained through telephone interviews.

After preliminary analysis of the data collected from the questionnaire, a follow-up telephone interview was conducted in March 1997 with 9 of the participating dentists who had indicated they did not refer patients with TMD to a physical therapist. Each of the 9 dentists were asked to respond to the following questions: 1) Can you give three reasons why you do not refer patients with TMD to a physical therapist?, 2) Are you familiar with physical therapy treatment for TMD?, 3) Have you had any formal education regarding physical therapy intervention for TMD in dental school or through continuing education courses? The purpose of the interview was to gain insight into the current understanding the dentists interviewed have of physical therapy involvement in the treatment of TMD.

Procedure

The cities were randomly selected from a list of metropolitan areas meeting the population criteria in the five midwestern states of Illinois, Indiana, Michigan, Ohio and Wisconsin. One hundred dentists were selected at random from the 1996-1997 yellow pages telephone directories of each of the three metropolitan areas chosen for study. The questionnaire was sent to each subject via regular U.S. mail along with a personalized letter and a self-addressed, stamped return envelope. The survey was conducted between August and October 1996. Data analysis was performed in January, 1997 for project
completion by April, 1997. The questionnaire provided data regarding dental referral to physical therapy in the treatment of TMD. The data was analyzed to determine the number of dentists that refer patients with TMD to physical therapy.

The subjects were informed of the procedures taken to ensure confidentiality of all information. Subjects were provided with information regarding the nature of the study, how the data would be used, and who would use the data collected.

The researchers were available to each subject by telephone should questions arise.

Data Analysis

The data from the questionnaire was analyzed using descriptive statistical analysis for interval data and Chi Square analysis for categorical data. A confidence level of $p = .05$ was established by the authors as their accepted level of significance prior to data collection.
CHAPTER FOUR

Results

Of the 300 surveys sent out, 126 dentists responded (42% return rate). Of the respondents, 113 (89.7%) were general practitioners and 13 (10.3%) were specialists. One hundred of the respondents indicated that they treat patients suffering with TMD. Of those practitioners treating patients with TMD, 91% reported they refer to other professionals, but only 35% refer to physical therapists.

When comparing years of practice of all respondents to referral to physical therapists, no significant relationship was found (Table 1). Similarly, there was no significant relationship found between percentage of TMD patients in a practice and referral to physical therapists (Table 2). However, when comparing practitioner type (generalist versus specialist) and referral to physical therapists, there was a significant difference in referral frequency. Specialists were much more likely to refer to physical therapists \((p < .05)\) than generalists (Table 3a). Seventy-nine generalists and 3 specialists responded that they never refer patients with TMD to physical therapy, 23 generalists and 4 specialists indicated occasionally referring, 8 general practitioners and 5 specialists reported frequent referral to physical therapists, and only 3 generalists and 1 specialist stated that they always refer their patients with TMD to physical therapists (Table 3b).
Table 1. Years of practice and referral to physical therapy.

<table>
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<th>Yr 1-10</th>
<th>Yr 11-20</th>
<th>Yr 21 or &gt;</th>
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<td>33</td>
<td>29</td>
</tr>
<tr>
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<td>8</td>
<td>22</td>
<td>14</td>
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<tr>
<td>Totals:</td>
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<td>55</td>
<td>43</td>
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p = .5902

Missing Data = 1

Table 2. Percent of TMD patients in practice and referral to physical therapy.

<table>
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<th>Eleven % or &gt;</th>
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<td>11</td>
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<tr>
<td>Yes</td>
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p = .1621

Missing Data = 1

Table 3. General practitioner versus specialist and referral to physical therapy.

Table 3a. Collapsed Data

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<td>Yes</td>
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<td>10</td>
</tr>
<tr>
<td>Totals:</td>
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<td>13</td>
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</tbody>
</table>

p = .0008

Table 3b. Observed Frequency Data

<table>
<thead>
<tr>
<th>Never</th>
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<th>Freq.</th>
<th>Always</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>79</td>
<td>23</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Special</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

| Totals | 113   | 13    | 27     | 4      | 126    |

<table>
<thead>
<tr>
<th>General</th>
<th>Special</th>
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<tbody>
<tr>
<td>Totals</td>
<td>113</td>
</tr>
</tbody>
</table>
The survey asked practitioners whether they consider treatment of TMD with other health care professionals as team care. One hundred and five general practitioners and 11 specialists responded yes, six generalists and two specialists responded no. A 2:1 ratio was found between dentists referring within their own profession and those referring out of their profession. One hundred and sixteen respondents indicated that they refer patients with TMD to other dental professionals, while only 55 respondents stated they refer patients with TMD to a professional outside of dentistry. Additionally, many of the 55 respondents who indicated referring to professionals outside of dentistry also reported referring to other dental practitioners.

In response to question one of the phone interview (can you give three reasons why you do not refer patients with TMD to a physical therapist) 7 of the 9 dentists indicated that they had no relationship with a physical therapist and did not know of a physical therapist who treated TMD. Seven practitioners stated that they were not familiar with physical therapy treatment for TMD. Other reasons given for not referring to physical therapists were the following:

- dentist refers to a specialist who refers to physical therapy
- not trained in how to make a physical therapy referral
- dentist personally provides some physical therapy exercises
- lack of knowledge about insurance coverage
- associates physical therapy treatment with chiropractic treatment
- content with current referral sources
- not cost effective for patient
- less than 10% of practice concerns TMD therefore physical therapy treatment not a great concern.
When responding to whether they were familiar with physical therapy intervention for TMD, 7 practitioners said they were not knowledgeable, and 2 practitioners indicated they had limited knowledge of physical therapy intervention for TMD. The third question regarding formal education in using physical therapy intervention revealed that 4 practitioners said physical therapy treatment for TMD was mentioned as a treatment option, but the intervention was not described. Five of the practitioners indicated they had not received any formal education regarding physical therapy intervention.
CHAPTER FIVE

Discussion

As hypothesized, the results indicate the majority of dental practitioners do not refer their patients with TMD for physical therapy treatment. It was also found that neither years in practice nor the percent of patients with TMD in the dental practice impacted referral to physical therapy. The literature reveals TMD can be successfully managed with an interdisciplinary team composed of a dentist and a physical therapist (Kraus, 1994; Friedman and Weisberg, 1982; Solberg and Fricton, 1992; and McKinney and Mosby, 1990). Danzig and Van Dyke (1983) reported that prior to associating with a physical therapist, their patients with TMD recovered at a slower rate and with mixed results. In a study of treatment outcomes for consecutive TMJ clinic patients (Clark, Lanham, and Flack, 1988), it was reported that the most improvement was observed in those patients receiving either physical therapy treatment alone or with a stabilization appliance used in conjunction with physical therapy, when compared to treatment with a repositioning appliance alone or no treatment.

The follow-up telephone interview with dental practitioners revealed a lack of formal dental education regarding physical therapy intervention for TMD. This may be one reason why there is a lack of interdisciplinary care in the management of TMD. Huff, et al (1995) and Perkins, et al (1994) believed training students to work on
interdisciplinary teams improved the efficacy and effectiveness of health care delivery. In addition, Infante, et al (1976) believed continual support was required once students enter their professional world in order to make the educational experience carry over into professional practice.

Physical therapists are skilled in the assessment and treatment of musculoskeletal components in health care (Friedman & Weisberg, 1982). Temporomandibular disorder involves not only the teeth and jaw but also has a musculoskeletal component. Therefore, dental school education regarding interdisciplinary team care should incorporate the profession of physical therapy as well as other disciplines. We also recommended that during the TMD education of dental students, a physical therapist be present in the clinic to interact with and educate the upcoming dental community.

This educational process could also be accomplished through continuing education courses conducted by a physical therapist in cooperation with a dental practitioner. It is recommended that formal contact between the American Physical Therapy Association, American Dental Association, and the American Association of Dental Schools be established to provide more complete continuing education courses. The purpose is to open a dialogue among the associations to explore enhancing the educational experience of each constituency, particularly in teaching cooperation.

The majority of practitioners interviewed indicated they are not familiar with physical therapy treatment for TMD and do not have a relationship with a physical therapist in their area. It is apparent that physical therapists in their communities are not advocating their treatment protocols to dental practitioners. Physical therapists could
facilitate an interdisciplinary relationship with dentists in their community by initiating contact with the dental practitioners and educating them regarding physical therapy intervention.

Another finding from our telephone interview was that dentists referred patients with TMD to a dental specialist who then frequently referred the patient to a physical therapist. General dentists frequently use an occlusal appliance and pharmacotherapy as their treatment methods of choice (Okeson, 1996, p. 145 & 150). We believe when these methods of treatment fail, general practitioners are most likely to refer to another dental specialist. It is our belief, when occlusal and pharmacotherapy are introduced, physical therapy intervention should also be initiated. Early physical therapy intervention may eliminate the need for a referral to a dental specialist who in turn would refer to a physical therapist. This treatment protocol potentially would provide a more cost effective treatment plan.

This study was limited by the sample population being restricted to three metropolitan areas of the midwest with populations greater than four hundred thousand. Additionally, only nine of the 126 practitioners participated in the telephone interview and did so on a voluntary basis. Dentists were asked to respond to whether or not they considered treatment of TMD with other health care professionals as team care. No definition of team care, or specifically interdisciplinary team care, was provided in the survey. When dentists were asked if they refer their patients with TMD to other professionals for co-treatment, the words never, occasionally, frequently and always were
listed. These terms were not defined in the survey, therefore leaving interpretation to the respondent.

An interdisciplinary approach provides the most comprehensive treatment for TMD as evidenced by the literature reviewed for this study. The study clearly shows a limited relationship currently exists between dentists and physical therapists. The study also proves that, as a result of this limited relationship, an interdisciplinary approach does not exist between these two professions. In order for an interdisciplinary relationship to develop between dentists and physical therapists, it is necessary that the dental profession refer patients with TMD to physical therapy.

Further research in the area of interdisciplinary care for the treatment of TMD is indicated to enhance the quality of care for this patient population. Also indicated is further inquiry into the educational structure of cooperation between dental and physical therapy schools regarding TMD. The qualitative aspect of this study could be expanded to further investigate the reasons for lack of referral to physical therapy.

In conclusion, it is clear from this study that the interaction between dentists and physical therapists in the treatment of TMD could be greatly enhanced. There is obviously a need to educate dental practitioners on the benefits of physical therapy intervention for patients with TMD. There is also a need for formal dental education regarding an interdisciplinary approach to the treatment of TMD.
REFERENCES


Hampf, G. (1992). A New Clinical Approach to the Treatment of Temporomandibular Dysfunction and Orofacial Dysesthesia: Natural History and


APPENDIX A

TMD Questionnaire
August 7, 1996

Dear Doctor:

We are graduate students at Grand Valley State University in Allendale, Michigan, enrolled in the Physical Therapy Masters Program. We are conducting a survey among dentists to ascertain information regarding current practice treatment policies of patients with temporomandibular joint dysfunction (TMD). We are conducting this research as part of our Master's Thesis project.

We would greatly appreciate your cooperation with this project and hope you will fill out the enclosed questionnaire. Information obtained will be kept confidential.

We will be conducting a follow-up interview of a small sample of practitioners on a volunteer basis. If you would be willing to participate in our follow-up study, please indicate this at the end of the questionnaire by supplying your name and phone number.

Thank you in advance for your cooperation.

Sincerely,

Brenda Mitus (616-361-5708)
Amy Neer Jones
Wendy Knight
TMD QUESTIONNAIRE

*Completion and submission of this questionnaire constitutes your consent for participation in our study of the existing relationship among dentists and physical therapists in regards to the treatment of patients with TMD.

1. What type of dentist are you? Circle one: General Specialist

2. How many years have you been practicing dentistry? ________(years)

3. Do you treat patients with temporomandibular joint dysfunction? Yes No If yes, what is the average percentage of temporomandibular joint dysfunction patients you treat per year in your practice? Circle one:

   Less than 10%  10-25%  25-50%  50-75%  75-100%

4. Circle the treatment methods that you use.

   Occlusal appliance  Occlusal equilibration
   Pharmacotherapy  Thermal packs
   Relaxation techniques  Stress management
   Biofeedback  Electromyographic biofeedback
   Isometric exercises  Other: _______________________

5. Do you refer your patients with temporomandibular dysfunction to any other professional for co-treatment? Circle one: Yes No

If yes, what is the average percentage of your temporomandibular patients that you refer elsewhere? Circle one:

   Less than 10%  10-25%  25-50%  50-75%  75-100%

Do you refer to: (check appropriate column for each profession with an X)

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<th>Occasionally</th>
<th>Frequently</th>
<th>Always</th>
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<tr>
<td>Psychologist</td>
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</table>
6. Would you consider treatment with other health care professionals in the treatment of TMD as team care? Circle one: Yes No

7. How often do you describe your treatment techniques to the above listed professionals? Circle one:
   
   Never  Weekly  Bi-weekly  Once a month

8. How often do you confer (have a conference or meet for discussion) with the above listed professionals in the treatment of TMD patients? Circle one:
   
   Never  Weekly  Bi-weekly  Once a month

Please circle the following modes of interaction that apply:

   Face to Face  Phone  Letter/Fax

9. Are treatment/progress notes from all team members treating TMD kept in a central location that is easily accessible? Circle one: Yes No

10. When an individual professional is treating the patient, are treatment goals set by:
    Check one:
    ___ Team  ___ Individual Professional

11. Have you ever sought assistance from healthcare professionals in a different field in regards to preparing a treatment plan? Circle one: Yes No

12. Have you ever changed your treatment approach after conferring with another healthcare professional? Circle one: Yes No

13. Would you be willing to participate in a telephone survey regarding this research at a later date? Circle one: Yes No

   Telephone number: ____________________
   Good times to be reached: ____________________