

Section 4  
Complimentary Technologies to the T-Scan 10 System

Chapter 7  
Modern Technology Enhances  
Diagnostic Accuracy and  
Outcome Assessments

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**ABSTRACT**

*Incorporating modern technology into clinical diagnostic methods does not necessarily replace traditional diagnostic methods, but ultimately represents an opportunity to improve patient care. Objective biophysiological measurements (BPM) enhance both the clinical information obtained from the patient's report of symptoms, and the clinical observations made during a patient examination. It has been universally acknowledged that combining multiple tests enhances diagnostic sensitivity and specificity. Further, an increase in the objectivity of the diagnostic process from using quantifiable, biophysiological measurement data, improves treatment progress monitoring and outcome assessment, by reducing the clinician's total dependence on both patient feedback and clinical opinions. This chapter discusses several dental technologies that are now readily available that provide objective bio-physiologic measurements of masticatory function. Biophysiological measurements have the potential to provide detailed, objective analyses with increased specificity. Each diagnostic technology is illustrated with examples recorded from both asymptomatic control subjects, as well as from patients with specific masticatory dysfunctions. The significance of these instruments is that any dentist can use these technologies to better understand their patients' conditions and to verify their degree of success after each rendered treatment. A recommendation is provided that dental medicine should accept the use of modern computer technology as an indispensable part of making an accurate diagnosis, monitoring treatment progress and assessing the quality of the outcome results. An essential portion of this chapter addresses the unfounded resistance to these differing technologies, especially amongst academia, which should no longer inhibit their widespread clinical implementation. Importantly, biophysiological studies suggest that well-documented emotional symptoms (like depression, anxiety, catastrophizing, etc.) often associated with Temporomandibular Disorders (TMD), are most often triggered by physical pain from structural disorders, rather than being themselves etiologic of TMDs.*

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## INTRODUCTION

There are three types of data collection methods used in healthcare to gather information for research, for diagnostic purposes, or to monitor treatment outcomes.

They are:

- Healthcare Data Collection ..... Type of data
- Self-Report (Patient History) ..... Subjective
- Observation (Clinical Examination) ..... Subjective/Objective
- Bio-Physiologic Measurement (BPM) ..... Objective/Subjective (Interpretation)

Of the above three methods, Biophysiologic Measurement (BPM) is the most quantifiable (e.g. blood pressure, heart rate, range of motion, muscle activity, TMJ vibrations, the distribution of occlusal forces, etc.), since BPM incorporates modern measurement equipment, and currently takes full advantage of the latest advances in computer technology. Despite the advantages of incorporating digital technology into dental practice, a small minority of recalcitrant *nay sayers* within the dental community, have substantially retarded the widespread application of technology into dental diagnosis and treatment monitoring (Greene, 1973; Greene, 1995; Reid & Greene, 2013; Greene, Klasser & Epstein, 2010; Greene, 2010a; Greene, 2010b; Greene, 2001; Greene & Manfredini, 2020; Greene & Manfredini, 2021). In the 21<sup>st</sup> century, this resistance is surprising, especially considering that there exists a myriad of evidence-based information, published studies, and extensive dental literature that demonstrates the efficacy of various technologies for specific dental diagnostic, treatment, and outcome applications.

Historically, a few published opinion articles that appeared in 1969 and 1970 proposed an emotional stress-related theoretical epidemiology of what was then coined “*Myofascial Pain Dysfunction Syndrome*” (MPDS) by their authors. (Laskin, 1969; Greene, Lerman, Sutcher & Laskin, 1969; Laskin, 1970). To date those few opinion articles, often repeated (Greene, 1973; Greene, 1995; Greene, 2010a; Greene, 2010b; Greene, Klasser & Epstein, 2010), have long fueled the opposition to employing computer technology when diagnosing, treating and objectively measuring the outcomes of Temporomandibular Disorders (TMDs) patients.

### **The Pitfalls of the Biopsychosocial Etiologic Theory and the Research Diagnostic Criteria (RDC/TMD)**

The more recently promulgated but similar *Biopsychosocial Etiologic Theory* mostly disregards the role that masticatory system structural breakdown plays in the appearance of Temporomandibular (TMD) symptoms, thereby denying any need to measure physical structures and function. This stress-related epidemiologic theory was revisited and re-perpetuated from the early 1990s into the mid-2000s, when the so-called “Research Diagnostic Criteria” (RDC/TMD) was postulated and actively promoted as a method to diagnose TMDs (Dworkin & LeResche, 1992). The RDC/TMD was subjected to 15 years of National Institute of Dental and Craniofacial Research (NIDCR) validation studies until 2007, at which

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