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Presented to American Academy of Periodontology
New Orleans, LA

This session should be understood to be only what it is intended to be: an introduction to Performance Logic. It is intended to provoke thoughtful inquiry into the way we do things in dentistry: how we perform.

Much of what we have learned to do has been learned through self-discovery, by observation and emulation of others, by occasional and conflicting direction from others, and by intuition. We are concerned with the ends of our acts, the product intended, whether that product is a cavity preparation, or a restoration, or a tooth free of calculus, or a smooth root, or a clean-edged elevated flap.

And that concern for product is understandable because, unless your dental school was significantly different from mine, the ends of our acts – the product – was stressed in our training. We were occasionally shown how to do something, how to perform, but the reasoning behind that performance was seldom clear either to us or to our teachers. And now, as teachers, our stress is still on the product, probably almost to the exclusion of the performance.

One of the reasons for this stress on product is that it is comparatively easy. It is almost always easier to critique the results of an act than to critique the act itself. It is easier to set specifications for the product – Is there calculus present? Is the root smooth? Is the edge of the flap clean? – than to set specifications for the performance – Are the patient and the performer spatially related to each other properly? Is the performer's posture best suited for the act? Is the patient positioned optimally? Is the correct instrument being used correctly? Is the appropriate part of the instrument being applied appropriately? Are forces applied through the proper distance? Each of these latter questions contains commonly used vague specifications: proper, best suited, optimal, correct, appropriate.

With precise specifications established for the ends of acts – the product – and generally imprecise specifications set for the way of acts – performance – it is not surprising that students do different things differently at different times and that scaling and root planing are spoken of as "the most demanding and difficult skills to learn in dentistry."

Performance Logic helps because it speaks the language of specifications.

Another reason for the much greater stress on the product than on the performance is that we do not look favorably on freedom of choice about the ends of an act, whereas freedom of choice about the way of the act is encouraged. "There is calculus present and it must be removed. You really don't have any choice about that. So remove it the best way you can. Try this instrument. Try that one."

Performance Logic helps because it offers freedom from choice in performance: "This is the surface to be acted upon. This is my posture and the patient's position and my spatial relationship to the patient that will permit me to direct controlled forces in harmony with my natural action as a human being. This is the instrument I will use. This is my instrument grasp. This is my hand stabilizing point. This is the part of the instrument that will act. This is the distance I will move that part from this reference point to that reference point. I know all of these this's because someone has analyzed the act in relation to the site of action and has specified the this's. There may be other choices available but now I needn't choose. Now I need only perform, be aware of my performance, and perfect it. I understand the logic behind the analysis and the specifications and I will apply that logic to other situations of a similar nature."

What, then, is Performance Logic? It is a system of reasoning applied to optimum control in the relation between the ways and the ends of acts. This system of reasoning, this Performance Logic, has been developed over a period of thirty years and is being continuingly reviewed and refined by its originator, Dr. Daryl Beach, an American dentist at the Human Performance Institute in Atami, Japan.

I was first associated with him and impressed by him in the late 1950s when we were dental officers practicing restorative dentistry in adjacent offices at the U.S. Naval Dental Clinic in Yokosuka, Japan. If pressed about it, I would admit to having been regarded as being rather good at providing restorative care, both in quantity and quality. And I would also admit that Daryl's restorations were equally good. But he could out-produce me at least two-to one. At the end of a busy day he was fresh and full of spirit and off to whatever dental group he was addressing that evening. (Parenthetically, I might add that Dr. Beach, as a faculty member at Tokyo Dental School, was the motivating force behind the elimination of arsenic oxide as a pulp mummifier and the introduction and use of local anesthetics in dentistry in Japan.)

Concerning my productivity as measured against his: it was not until many years later that I came to realize that my stress had been on the product and that his was on the performance. He was, even then, aware of and analyzing performance with an acuity that was unique. He was perfecting his doing in such a way that it was approaching harmony with the natural way of human action. He was eliminating redundancy and retaining that which is natural and necessary.

Among the many questions he was asking about all aspects of human performance was the question, "If I intend to intervene in the oral health status of another human being, what posture should I assume?" He reasoned that it should be a posture in which gravity is resisted with least strain to the larger muscle masses of the body, and it should be such that finite application of force through distance can be accomplished in a controlled manner and consistent with the natural unstrained direction of force delivery by the index finger and thumb.

Just for a moment, I'd like to compare two entirely different deliveries of force through distance. First, consider our actions when splitting logs for the fireplace. In order to deliver the blade of the ax to the precise spot on the end of the log where we intend the split to occur, it is necessary to activate practically all the muscles of the body: some for mass movement of the ax, some for antagonistic action against others to maintain balance and to permit control of the ax, and some for precise control of the ax as it swings to the strike. If, after we have developed the skill necessary for accurate, forceful delivery of the ax to the log, we were to analyze our individual performances, we would find certain commonalities among our acts: the location of our wrists relative to the blade head on the horizontal plane when the strike occurs, the bend of our knees and hips, and so on. And one of the major commonalities also realized is that we would have positioned ourselves and the log so that it is squarely in front of us, neither to our left nor to our right.

Compare our actions in splitting wood with the act of threading a needle with a piece of thread. In this act it is not necessary to activate large muscle masses to any extent. In fact, any such movement of large muscles would be redundant, unnecessary, and distracting to the performance of the intended act. What is necessary is great stability and precise control of minor movements of our finger and thumbs, the finite application of force through a limited distance. And when we have mastered the skill of threading a needle readily we would find that the normal tendency, the natural tendency, is to position our hands so that the needle and thread are directly in front of us, neither to our right nor to our left. This natural tendency to position the site of application of finite force directly in front of the body is evident when we observe

the actions, of, for example, a watchmaker, or a pistolsmith or a camera repairman.

Performance Logic concludes that the site of application of finite force through limited distance should be on the mid-sagittal plane of the operator's body when he is in a balance posture that requires least effort of the large muscles to resist gravity.

Balanced posture or Reference Control Posture is characterized by an erect spine (T6 in line with sacrum) supported by the ischial tuberosities in contact with a lightly cushioned stool without backrest, femur parallel to the floor (top of thighs inclined slightly forward), legs at right angle to femurs, feet flat on floor, shoulders horizontal, arms vertical, elbows near body, Frankfurt plane horizontal, hands at a level with the heart, index finger and thumb contacting directly in front of the body.

I would like you to direct your attention to the booklet "Performance Logic in Dentistry." This booklet was prepared by Dr. Howard Strassler for use by first and second year students in courses conducted by the Department of Fixed Restorative Dentistry at the University of Maryland Dental School in Baltimore. Please turn to page 9 and to the reference postion of the operator's hands, identified as "Mi 09". This is the location and position of the operator's hands when he is in reference control posture and is performing finite, controlled movements. It is the reference point for all elements of the environment; that is, everything else that is involved in performance. It determines patient's head position, operator's eyeglass prescription, location of instrument trays, air and water syringes, handpiece at rest, operating light, assistant position and posture. It is the basis for instrument design and grasp, direction of applied force, mirror control and sight line. Whenever possible and practicable, the environment is made to relate to Mi 09 whether the environment has already been established, as in a dental school or dental office, or whether the operator begins his design in an empty lot.

The line drawings on the next page illustrate the position of the patient with the oral cavity related to Mi 09 and the operator maintaing reference control posture. The patient is supine, has multiple support areas, and is positioned to facilitate controlled delivery of forces by the operator's finger and thumb through natural force vectors: the index finger moving in an arc toward the operator's chest and perpendicular to the maxillary occlusal plane, and the thumb moving in an arc toward the floor and perpendicular to the mandibular occlusal plane. These natural movements of the thumb and forefinger at Mi 09 are, in fact, the determinants of where the operator positions himself in relation to the patient – the o'clock position, as it would commonly be called. Natural force vectors also determine the attitude into which the patient's head is positioned for an intended performance on a given surface of, for example, a tooth.

The line drawings on page 15, indicate reference positions of the operator around the patient and of the patient's head positions. These positions are indicated by the call sound "Mi" followed by a sentinel number and by a specification number.

The call "Mi 1", then, sentinels that the operator's position around the patient's oral cavity is about to be specified. For example, the completed call, "Mi 1-3" indicates that, for a given performance, the operator is to assume a postion at the right side of the patient's head, 45 degrees on an arc counterclockwise from the reference position Mi 1±0, which is directly behind the patient.

"Mi 2" sentinels that the patient's head tilt, backward or forward, is about to be specified. For example, the completed call, "Mi 2±0," indicates that the head is to be in its reference position with the maxillary occusal plane tilted back seven degrees from vertical.

Likewise the call, "Mi 3-1," indicates that the patient's head is to be tilted to the left so that the mesial-distal line of the teeth in the left posterior sextant is perpendicular to

the floor. The call, “Mi 4+2,” indicateds that the patient’s mouth is to be opened so that the distance from maxillary central incisal edges to the mandibular central incisal edges is 44 millimeters or maximally opened.

During training in Performance Logic, the student – whether undergraduate or postdoctoral – learns these Mi sentineled positions. The instructor then can indicate the desired positions either verbally or in writing. For the positions just described, then, the curricular notations would be “Mi 1-3, Mi 2±0, Mi 3-1, Mi 4+2.”As it happens, these calls describe operator/patient positions for scaling and root planing the facial and mesial surfaces of teeth #3, 4 and 5 with a Gracey #2 curette. Further specifications can be stated in the established syllabo-numeric language of Performance Logic to indicate precisely the finger-instrument contact points (the instrument grasp), finger point-tooth point contact (the finger rest, or fulcrum, or hand stabilzing point), mirror postion, sight line, tooth and tooth surface point-of-force application, instrument point/surface point contact, force vectors, and point-to-point force-delivery distance.

Performance Logic speaks the language of specifications, and during this session you have introduced to that limited portion of the Mi vocabulary related to Reference Control Posture and to the positioning of performer and patient. The concepts introduced are only a tiny fraction of those generated by Performance Logic. If their introduction causes you to inquire thoughtfully and analytically into your own concepts of operator posture and operator/patient positioning, I will consider the session a success.

If you have additional interest in the practical application of Performance Logic Dentistry, I invite you to attend one of the Continuing Education Courses presented at our school and to visit the Center for the Study of Human Performance in Dentistry there. Teachers, especially, should be intrigued by the Performance Simulation Unit, a kind of mannikin-laboratory designed on the basis of Performance Logic. All dentists would find many admirable features in the Optimum Management Unit, a complete, operating practice-setting designed in accordance with Performance Logic.

And, then, if you would like to meet a truly original, dedicated, brilliant and gentle man; or if you would like to experience new and exciting cerebral synaptic firings; or if you would like to enjoy a delightful resort city; or if you would like all of these, you might consider arranging a stay of a week or two in Atami, Japan, to visit the Human Performance Institute and to experience Dr. Daryl Beach.