The Roles of Evidence and the Baseline in Dental Decision Making

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Abstract

Decisions are courses of action that exclude other actions and are based on information that is subject to error. Sometimes that information is evidence gathered about a particular situation; sometimes it is general knowledge about similar situations. A very simple example is used to show that the best decision making strategy is to consistently favor the most likely outcome based on previous experience if one is using baseline information. This is more effective than probability matching or dividing resources evenly. The same advantage of “sticking with the winner” applies when one is making a decision based on evidence. When both baseline information and evidence are available, only one should be used—the one with the highest accuracy. They cannot be combined. The evidence-based dentistry controversy is analyzed from this perspective. It is shown that evidence has the highest accuracy for the controlled circumstances that researchers investigate and that the baseline has the highest accuracy for the natural circumstances that dentists encounter. The relative roles of the baseline and of evidence in decision making are applied to investing in the stock market and for showing that both examination-based relicensure and the current practice of testing for initial licensure are indefensible because they ignore the baseline.

Dentistry is having a little trouble deciding where it stands on evidence-based practice. Systematic and shared inquiry, grounded in the conventions of one’s peers is the bedrock of all professions. Good dentistry depends on good science. But that does not mean that dentists should be scientists and it certainly does not mean that dentists should turn over their decision making to biomedical or policy researchers. There have been recent calls to change curricula in dental schools so that dentists become wise consumers of research. Strangely, there are no complementary calls that researchers should be trained to understand the logic intrinsic to dental practice.

Although evidence-based dentistry is theoretically defensible, it often seems a bit impractical. Every case of recurrent caries is not a research project. Most of dental practice, including diagnosis, is the reflexive application of learned connections. That is true of all human behavior, and scientists who study human performance use the term “forward thinking” to describe the way we normally proceed in life. Effective people have large repertoires of “If condition C, then action A...” that have become habit and are appropriate to the circumstances.

It is only when forward thinking rules produce surprising results or when intuition borne of experience counsels caution that we begin to problem solve. Human performance researchers call this “backwards thinking.” Competent individuals are usually as effective at forward thinking (rule following) as experts are. The difference becomes apparent when the context is complex and likely to require some problem solving as well. That is where the experience of expertise shines—especially in the part about recognizing that there is a problem.
Evidence costs. There is a hope among those who embrace evidence-based practice that improved technology will reduce these expenses to a point that justifies their benefits. But even sound evidence may be superfluous. Caries must be removed under amalgam restorations. A computer search for meta-analysis research data supporting this view will have absolutely no impact on the daily practice of dentistry.

There is a sense in which the dental literature systematically misrepresents dental practice. Case studies are selected for publication because they are unusual and not because they represent what dentists typically encounter. Research articles involve artificial assignment of patients and control of circumstances that would normally be inappropriate in practice. The custom that research articles begin with a review of the literature in order to establish a scientific context cannot be generalized as appropriate to typical dental treatment. In a word, the scientific literature in dentistry contains an inherent sampling bias. Precisely because it is science—an investigation of the unknown—the role of evidence will be greater in research than in practice.

Besides the costs of getting evidence, all of the interesting stuff has some probability of being wrong and therefore misleading. Decision making in dentistry, as in all other areas of human activity, is effected by both the quality of available evidence and the underlying distribution of events. Our recent preoccupation with the quality of evidence has drawn attention away from the baseline realities of dental practice. This column offers practical advice about when it is best to ignore the evidence, regardless of its quality.

The Basic Concept
The roles that evidence and the baseline play in decision making can be determined with considerable precision, even mathematical precision. Understanding this relationship often creates a challenge to fundamentally held beliefs regarding such issues as evidence-based dentistry, investment in the stock market, in-office audits for continuing licensure, and the initial licensure examination—all of which will be discussed in this column. Because of the numbers involved and the counter-intuitive conclusions that are sometimes reached, the basic relationship between evidence and the baseline will first be explained using a straightforward and unemotional example. If mathematics are put-off-ish, one can skip this section and take my word for the applications that will begin in the subsection entitled “The Combined Contribution of Baseline and Evidence” or take five minutes to learn this simple and powerful tool for decision making developed in the following ten paragraphs.

The Contribution of the Baseline
Assume that a dentist has purchased a special piece of equipment which he uses for many of his patients—perhaps an intraoral camera. He has two operatories that are approximately 20 feet apart. When the equipment is in the operatory where it is needed, there is no delay; but if the equipment is in the other operatory and must be retrieved, the round trip costs the dentist (or more realistically the chairside assistant) 40 steps. It has been worked out over time that the baseline—the proportion of times patients who need this equipment are in Operatory A—is 80%. Here is the question: Assuming that it requires none of the dentist’s time to set up the equipment in either operatory, where should the equipment be placed before each appointment in order to minimize the number of steps or the lost productivity bringing the equipment into use?

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The first strategy is to ignore the baseline and place the equipment in Operatory A 50% of the time and in
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Operatory B 50% of the time. If this strategy is adopted, the dentist will take an average of 20 steps for every appointment. Here is how that 20 step estimate is determined. There are four possible outcomes: (a) Equipment in A and needed in A, (b) in B and needed in B, (c) in A but needed in B, and (d) in B but needed in A. The outcome of the first two cases is the same—no steps. The outcome of the last two cases is also the same—40 steps each. Now all we have to do is figure out the probability of each of these four outcomes.

The total expected value for the strategy of even distribution of the equipment between operatories is the sum of the expected values for each outcome that could result from the strategy: \(0 + 0 + 4 + 16 = 20\) steps. If records are kept for a period of time, the average number of steps per appointment will be 20 using this strategy. The same result would be expected if the equipment were alternated between operatories or if a coin were flipped. It is even the case that the same expected value of 20 steps would obtain if the equipment were placed in the hall equidistant between the operatories (different numbers are plugged into the formulas, but the result is the same). In all cases of even distribution strategies, the baseline is ignored.

A second strategy is to leave the equipment in the operatory where it was last used. This might have some advantages since patients who need the equipment are more likely to be appointed in Operatory A and the equipment is more likely to be left in that operatory. Again there are four outcomes and their results are the same as those enumerated before: 40 steps for (c) and (d) and none for (a) and (b). But now the likelihood of each outcome has been altered. Consider (a)—equipment in A and needed there. Instead of the former probability of .40 (.50 \* .80), now we can expect that combination almost two-thirds of the time (.80 \* .80 = .64). The likelihood of other results is (b) .20 \* .20 = .04; (c) .80 \* .20 = .16; and (d) .20 \* .80 = 16. The combined probability of the results that would require movement, (b) and (c), are .16 + .16 = .32. The expected value of steps to be taken with this strategy is .32 \* 40 = 12.8.

The strategy of probability matching—allocating choices proportional to the baseline probability—is an improvement over the strategy of even distribution. This is true whether probability is matched with some random number generator, by hunch, through assigning the first X% of cases in a period to the most likely outcome, or by letting nature do the distributing by leaving things where they fall.

The third strategy for assigning resources when the baseline probability is known is the simplest; it is also the best. The strategy is called "stick with the winner." In this example of equipment in operatories, nothing can beat leaving the equipment in Operatory A all the time. Eighty percent of the time, the equipment will be where it is needed and no steps will be required; 20% of the appointments will result in travel and the expected value is 8 steps (.80 \* 0 + .20 \* 40). The full expected value calculation will confirm this shortcut reckoning. When meaningful baseline data are available, the wise strategy is "stick with the winner" and the expected payoff is the same as the baseline probability.

The accompanying table shows the general relationship among the three strategies for using baseline information. To make this principle general, an arbitrary prize of 100 is set as the desired result so that high values in the graph represent hoped-for consequences. In all cases the best strategy is "stick with the winner," followed by baseline probability matching, and then by even distribution of choices. The greater the amount of usable baseline information (the farther away the baseline is from a 50:50 split), the greater the advantage of using the correct strategy. For baseline probabilities less that .50, just flip the outcome con-
sidered—if the probability of the equipment being needed in Operatory A is .20, the probability that it will be needed in Operatory B is .80.

The Contribution from Evidence. But what of the role of evidence in such cases? For the moment, let’s ignore baseline information and concentrate on the accuracy of some sort of external information to aid in decision making (evidence). In our hypothetical example from the dental office, the evidence may come from front desk staff who use information about the treatment needs of patients who are scheduled in order to place the equipment in either Operatory A or B. This strategy would certainly have much to recommend it if the evidence used by the front desk staff was free of errors. For the sake of reality let’s assume that a combination of no shows, poor information collecting, and variability in patient treatment result in an error rate of 20%. In other words, the front desk is assigning the equipment based on evidence that is accurate in 80% of the cases. There are three strategies that can be used to make the assignments when such evidence is available: (a) ignore the evidence and assign the equipment evenly to both operatories, (b) match the distribution 80:20 to match the probable accuracy of the evidence, or (c) always assign the equipment based on the most likely outcome given the evidence.

The analysis of decision making based on evidence is exactly the same as the analysis of decision making based on baseline information. The conclusion one draws in either case are exactly the same—stick with the winner, especially if the winner has a good track record.

The Combined Contributions of Baseline and Evidence. Now we come to the issue of using both evidence and baseline information in the same situation. The appropriate strategy in this situation is also very simple, although the reasoning behind it is complex and it is sometimes resisted. The rule is “Base your decision on either the baseline alone or the evidence alone, depending on which one contains the most information.” If the baseline distribution of patients between operatories in our example is 80% for Operatory A, always assign the equipment to Operatory A if the front desk personal makes 20% or more mistakes on average guessing where to assign the patient. If the front desk is more accurate than 80%, always use that evidence. The reason this rule holds where decisions are involved comes from the symmetry of baseline and evidence when one course of action precludes others.

The example we are considering up to this point involves decision making—the commitment of resources to a course of action under conditions of risk (estimated probability). Many times, both the baseline and the evidence will support the same correct course of action; occasionally they will both support the same incorrect one. Where they disagree, however, they force a choice between one or the other incompatible courses of action. The three alternative decision rules we have discussed before apply in this case as well. Where evidence and baseline conflict the decision maker can ignore both and alternate between actions, engage in random probability matching, or always go with the long-term, most informative information.

Decisions vs Descriptions. The situation is different when a situation is being described as opposed to a decision being made. When an orthodontist does a space analysis, he or she considers the physical measures taken from the model as evidence and norms from the Michigan studies and personal experience as baseline. These are combined in the practitioner’s mind, with more credence given to the physical measures. Although it is common to record in the chart only the physical measures from the models, experienced orthodontists make mental allowances for measurements that might be flawed or that deviate unexpectedly from norms.

This practice of combining sources of information weighted for their relative accuracy is called Kelley’s Rule and is named after Truman Kelley, the developer of the modern IQ test and an advocate of using common sense in interpreting test scores. It is possible and even appropriate, to combine information from the baseline and from evidence when describing a situation. It is not appropriate to make these combinations when choosing a course of action. There is a difference between diagnosis (a decision) and the information that diagnosis is based on (a description). The role of evidence is different in these two cases.

Evidence in Research and Evidence in Practice. This extended discussion may help explain some of the tension that now exists in the profession surrounding evidence-based dentistry. Researchers for the most part are concerned with making accurate descriptions involving situations where there
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is no baseline information or where the situation has been manipulated to equalize the baselines (randomization and control). Under these circumstances, evidence is always of value for description and if decisions are made under circumstances that mimic the research, the evidence from any significant study will be better than the baseline. By contrast, practitioners are ultimately concerned with the category decisions of diagnosis and treatment. Unusual cases truly are rare and dentists have a rich foundation of experience which make it unlikely that evidence will alter established practice patterns. Thus “stick with the winner” baseline strategies will probably be the best course of action.

Two corollary points must be made before preceding with other illustrations of the relationship between evidence and baseline. First, although the theoretical explanation in the preceding paragraphs may seem overly detailed, human nature has this logic wired into it. Scientists who study human performance are in agreement that our lives—from how we maintain our body posture to the most sophisticated esthetic decisions—are controlled automatically by following the baseline. It is only when surprises occur that we look around for evidence. The second corollary point is that some advocates of evidence-based dentistry will find the reasoning in the preceding paragraphs awkward. They might even say that I have confused the meanings of evidence and baseline. Some of the advocates of this new thinking are actually advancing predetermined treatment plans or diagnoses based on best evidence and are advocating that such “pre-thought” treatments be used in all situations—as the “baseline” action. A more accurate term for this approach is protocol-based dentistry, and advocating that all dentists practice standard protocols should really raise some red flags. This is certainly not evidence-based dentistry, however, though practitioners who fear that it is tend to lash out at insurance companies on the belief that it is. A more promising alternative might be termed outcomes-based dentistry. In this model, dentists would keep track of their own treatment outcomes for various patient types, diagnostic categories or symptom clusters, and treatments. The goal would be to build baseline data personalized to the practice to increase diagnostic accuracy and treatment predictability.

Three Applications

The Stock Market. The stock market is an excellent example of the kind of thinking we have been analyzing. There are only three courses of action possible: buy, sell, or refrain from either. These decisions are made based on baseline, historical performance and on evidence such as the opinions of experts, leading indicators and other indexes, and personal analysis. Considering the baseline and the evidence, examination for relicensure makes no sense

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A second form of error is to place too much reliance on evidence (newsletters, annual reports, and even newspaper headlines) because that information is novel and especially if that novel information coincides by accident with any deviation from baseline expectations. The rule is always the same. Go with the baseline and ignore the evidence if the baseline has an overall long term higher probability of success: go with the evidence if the evidence has an overall higher probability of success. Switching back and forth is just another random walk.

Of course the stock market is more complicated than the simplified example of stationing equipment in a dental operatory. Both baseline and evidence information change over time and there are a huge number of alternative investments. It is also true of market situations that the large amount of money available and the large amount of intelligence that is chasing it will lead to a parity between baseline and evidence. The smart money has always said don’t “play” the stock market. The strategy should be to study and understand the economy as a whole and to predict its future performance. Stocks, bonds, funds, and other investments are then chosen which match your un-
understanding of the economy (not the market) and your own personal needs.

Examination for Licensure Renewal. The profession has long debated whether there should be performance requirements associated with periodic relicensure. Potential requirements fall into two categories: (a) participation in continuing education or other professional development programs intended to change what practitioners are capable of doing and (b) written or practical examinations, case presentations, or office audits that provide evidence of the actual level of performance. Participation in educational experiences is a different kind of issue than the one being discussed here. But examinations for relicensure do meet our criteria: the decision involves mutually exclusive courses of action (relicense or deny relicensure or perhaps probationary status) based on a combination of baseline information (practice competence in the profession generally) and evidence (tests or audits for a particular dentist).

Considering the baseline and the evidence, examination for relicensure makes no sense. To my knowledge there are no studies which would allow us to estimate the accuracy of reexamination evidence in predicting which dentists should be relicensed and which should not. (There have never been any programs that test dentists to determine whether they should continue practicing and then let those who failed the test remain active just to find out how accurate the test is.) But there is a fall-back position that allows us to place an upper limit on such estimates. It is possible to calculate the reliability of tests with multiple questions, examinations with multiple evaluators, in office audits with multiple records pulled, or any situation where multiple patients are used or could have been used. Although reliability (consistency of decisions) does not determine validity (accuracy of decisions), it does place a limit on it. (The mathematics of this relationship are somewhat complex but I have published a table which allows for direct visual determination of the relationship—see Recommended Reading.) If the reliability of evidence is measured at .20, the predicted validity must be in the range of .00 to .45 for example. While it could be anywhere in this area, depending on the representativeness of the test, it could never be higher than .45. If the reliability of the evaluation evidence is .70 or .80, as is common on written examinations, the validity could never be higher than .90, but could in fact be as low as zero if the test is consistently measuring the wrong thing.

Even with this much imprecision in estimating the accuracy of evidence for evaluating relicensure, we can draw useful conclusions. The proportion of practitioners who are so incompetent they should not be relicensed is a very small number. Published estimates of those who are technically incompetent range from 1% to 3% and those who are incompetent for any reason have never been estimated at more than 10%. Applying the basic rule, it is entirely safe to ignore evaluation information for relicensure, even when that information exists. The baseline competence for relicensure is reasonably 90% and probably much higher, while the accuracy of available information can be no more than 90% and is probably much less. Any efforts to develop better evaluation mechanisms for relicensure are a waste of valuable resources. An improvement in accuracy of such evidence from 20% to 40% or even 80% will have no defensible bearing on the proper decision. The amount of development time and testing costs required to bring evaluation for relicensure evidence to parity with the baseline would represent an unrealistic expense. It is not just charity to assume that dentists are competent professionals unless they show otherwise, it is also hard-headed logic to do so.

Let's consider another example along these lines that shows how even valid evidence can be damaging. There is a difference between saying that 20% of incompetent dentists will fail an examination and saying that of those who failed, 20% are incompetent. Although the two statements look similar, there is no way of concluding one from the other. If 20% of the phone calls received during the dinner hour are solicitations, it does not follow that 20% of the solicitations will disrupt our dinners. Each time we make a conclusion from test information, we are making a hidden assumption about the underlying distribution. We can untangle

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Some practical example of how to use evaluation evidence in drawing a conclusion might be the following. Assume that a state institutes a practice of randomly sampling dental offices through an in-office audit requiring half a day and pulling about a dozen patient charts. Because such a sam-

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The audit is a tiny percentage of dentists' actual work. We will assume that the audit has 20% accuracy, meaning that 20% of the incompetent practitioners will be identified as substandard using this process. But we do not know which ones they are. We also assume that 20% of those who are competent will fail the test because of an unlucky draw of charts or incomplete data. The final assumption is that 95% of the dentists in the state are competent. The question is when a dentist fails the audit, how likely is it that he or she is truly incompetent? The answer given these assumptions and Bayes theorem is .05. In other words, nineteen out of twenty dentists who fail this examination are in fact competent and would unreasonably be deprived of a license to practice or be subject to unjust scrutiny or probation. Perhaps, these numbers are not realistic and some method of in-office audit could be created that would be conducted in a reasonable period of time and be reasonably unobtrusive but yield a better estimate. Let's make the outrageous assumption that visitors remained in an office long enough to be 99% certain of the results. In this case, a score showing incompetence would still be wrong 15% of the time.

Those in the profession who have argued against relicensure based on any form of examination have traditionally pointed to cost and to unproven need for such a program. It is reasonable to add to these concerns a significant fear that a large number of competent practitioners will be mislabeled as incompetent despite the best efforts of those developing evaluation systems.

Of course the logic of these arguments applies only to random evaluation or to evaluating all dentists. If there is reasonable suspicion of a dentist's incompetence the baseline changes. Let's assume that the state board has some grounds on which to judge that a particular dentist is not competent, perhaps there is an estimate in the range of an 80% likelihood that he or she should not be practicing without appropriate remediation. Under these circumstances an in-office visit that found the dentist was not competent would be accurate 50% of the time even when the overall accuracy of the evidence is 20%. If the evidence has an accuracy factor of 70%, a conclusion that the dentist is not competent will be correct 90% of the time. Of course, this is exactly the system we have now. State boards investigate dentists against whom there are allegations of incompetent practice, using a judicious combination of appropriate baseline and evaluation evidence to both save resources and improve the accuracy of decisions. As a general rule, probable cause is a more accurate guide to policy in determining qualification to practice dentistry than is any effort in the direction of test construction.

Initial Licensure Examination. We draw the same conclusions regarding evidence and baseline for initial licensure examinations as the one for evidence and baseline on examination for relicensure of practicing dentists. Such examinations are indefensible for exactly the same reasons. American Dental Association and American Association of Dental Schools data place the percentage of students graduating from accredited dental schools and being licensed to practice within one year of graduation in the 90% to 95% range. Boards do not publish or otherwise make available their reliability statistics although it is reasonable to conclude that they are no better than similar kinds of a data from dental schools, and no board has ever published data refuting the assertion that their reliability is any higher than .50. (Of course it is illegal to conduct any study which would validate the accuracy of board decisions since those who do not pass the boards are pre-
vented from practicing whether they are competent to do so or not.) It is possible, however, to use the rules relating reliability to maximum possible validity as mentioned above to show that under the best of circumstances no amount of evidence from the initial licensure examination would be more useful that the baseline criterion. Fewer mistakes will be made in initial licensure by granting all graduates of accredited schools their license than are now made with an expensive and contentious system.

Initial licensure examinations are often defended on the grounds that they are administered as fairly as possible and that efforts are made to ensure the calibration of examiners. Anyone would be alarmed to hear otherwise, but none of these efforts addresses the validity of the examination, and it is unlikely that any practical improvements in the psychometric properties of such tests could override the substantial baseline effect. As Algina has observed (see Recommended Reading), this is true even when the costs of passing an incompetent dentist are greater than the costs of failing a competent one. No data have been presented that bear on the relative costs, although examiners sometimes say such a difference exists for recent graduates, if not for practicing dentists.

The major source of unreliability in the initial licensure exam, however, is not the calibration of raters; it is the variability from patient to patient. The fact that this source of variability is not measured on licensing examinations does not diminish the impact of this factor any more than one can avoid being late by not looking at his or her watch. In a study that paralleled the structure of initial licensure exams using a dental school mock board situation, the inclusion of variability from patient to patient and testing time to testing time decreased the measured reliability well under .20. The great inaccuracy of drawing a conclusion that a person who fails an examination with 20% accuracy and 95% baseline has already been demonstrated several paragraphs above in the discussion of in-office audit visits for relicensure of practicing dentists. The numbers are identical and the conclusion must be the same in both cases. A confirmation of this conclusion can be found in the fact that the pass rate on re-examination for initial licensure examination often is as high as 80% or 90%.

A final comment must be made on written examinations as part of initial licensure. There are a number of jurisdictions that add their own written examinations to those already required in every licensure jurisdiction and given under the auspices of the Joint Commission on National Board Examinations. The National Boards happen to have internal reliability coefficients above .90 because of the psychometric expertise used in their construction and the very large number of questions asked. Locally developed tests tend to be considerably less reliable.

A case that demonstrates concern over the validity of special-purpose, locally-developed written tests for initial licensure involves one concerning ethics in a jurisdiction to be unnamed. I was able to analyze that examination and determine that its accuracy was 85%. In other words, based on this examination 15% of candidates would be misclassified on average—although we do not know which ones they are. It seems unreasonable to me that 15% of graduating students are unethical. So I can only conclude that it would be unethical to label them as such based on a short examination that has a significant chance of mislabeling graduates. If the number is indeed 15% or higher of graduates or practitioners who are unethical, massive educational intervention is a wiser strategy than is testing.

To be absolutely fair concerning the test on ethics, its authors point out that most of the questions are on terminology in ethical theory and on understanding of the dental practice act. To call this a test of ethics raises an ethical question regarding misrepresentation. Further, the principal architect of this examination is a board member with considerable experience and has told me that the practitioners in his state who know the practice act by heart and can give multiple interpretations for each section are those who have actions against them by the board.
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Recommended Reading


Very technical paper on the accuracy of decisions made from test scores and baselines in the context of medical school passing rates. Argues that the best strategy is to pass all students. Also presents an argument that content validity (efforts to make certain that tests cover a representative set of material) are insufficient protection from weak predictive validity.


A readable introduction to ways of measuring the effectiveness of examinations. The basics of reliability and validity are presented. The graph showing the relationship between a test’s reliability and its maximum possible validity is contained in this article.


Here the general method for calculating the proportion of students receiving the wrong grade on a test is developed. This is a general solution that extends beyond the two-category (pass-fail) type of decisions considered in this article.


Study of a simulation of the fixed prosthodontics section of an initial licensure examination comparing four sources of variance: (a) examiners, (b) type of restoration, (c) experience of the operator, and (d) patient variability. Only the patient factor plays a significant role in overall reliability of scores. This is a source of variance that initial licensure examinations are blind to because they ask that the candidate perform each procedure only once. The overall reliability of scores in this simulation are in the .10 to .15 range.


This book was published seventy-five years ago; it is still as clear an elucidation of the way humans should think about data as one can find. In particular, Kelley lays out the rules for combining evidence and baseline information in estimating a score—describing a value (not to be confused with making a decision). An observed score (say a child’s IQ to use the case Kelley was most famous for) should be weighted by its reliability and the baseline (the average score for children of that age) should be weighted by 1 minus the reliability of the test. The best estimate for the true score will be a compromise between the observed score and the baseline based on their weights.


Sound investment advice—don’t “play” the market. Following the trends (random walks) is less effective in the long run than sticking with proven stocks.


A blend of the formal research literature in psychology and technical reports from industry, mostly case studies of accidents at nuclear power plants. The author argues that there are different kinds of errors which occur for different reasons and can be mitigated in different ways. Error results from a mismatch between the expected pattern of behavior and the requirements of the environment. Although this mismatch can be understood from an analysis of the patterns of human response (based largely on familiarity and similarity), the best forms of prevention are in systems design.


Managers approach decisions involving risk in predictable ways that differ from the classical rational approaches suggested by theorists. For example, they separate assessment of probability and outcomes and focus heavily on outcomes, especially negative ones. They reject the notion that they are gambling by defining gambling as one-time trials of pure luck. By contrast, executives feel they have special expertise and control, even after a decision has been made. They prefer to see decision making as sequential negotiation and reframing until they can get to a position of acceptable risk (potential cost).

Editor’s Note

Summaries are available for the three recommended readings preceded by an asterisk (*). Each is about four pages long and conveys both the tone and content of the book through extensive quotations. These summaries are designed for busy readers who want the essence of these references in fifteen minutes rather than five hours. Summaries are available from the ACD Executive Office in Gaithersburg. A donation to the ACD Foundation of $15 is suggested for the set of summaries on decision making; a donation of $50 would bring you summaries of all the 1999 leadership topics.