Bringing Evidence to the Practice of Human Performance

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History and Development of Evidence-Based Practice

Evidence-based practice traces its beginnings to the life work of Archibald L. Cochrane (1909–1988) in promoting evidence-based decision-making in the practice of medicine. Dr. Cochrane championed the gold standard of proof, the randomized, controlled trial, observing as late as 1972 that "The oldest, and probably still the commonest form of evidence proffered, is clinical opinion."[2, p.20]

Since then, many organizations have taken on the task of critically generating, collecting, and evaluating evidence to make well-founded recommendations in medicine and in other fields. In the international realm, the Cochrane Collaboration,[3] founded in 1993, has published recommendations on over 5600 topics. To get an idea of the impact these recommendations have, and where they are accepted and acted upon, El Dib et al.[5] did an analysis of a representative sample. They found that in 44% of cases, the reviewers concluded that an intervention was likely beneficial, 7% of interventions were found to be likely harmful, and in 49% of cases the evidence did not support either benefit or harm. In other words, more than half of interventions evaluated were worthless, or worse, and were a waste of time and effort on the part of practitioners and patients, and a waste of money for patients and their insurers. Thus, evidence-based practice makes good economic sense, as well as providing the best supported recommendations.

In the United States, the U.S. Preventive Services Task Force (USPSTF),[10] an independent volunteer panel established in 1984, has conducted hundreds of evaluations of evidence regarding clinical preventive services. Their website provides the results, targeted to primary care providers. They have also made their process available in a detailed manual.[9] Some of their findings have been highly controversial (see for example Moore et al.[8] regarding "the breast cancer controversy"), but even these have been generally supported by professional groups due to the transparency and thoroughness of the process used.

Applying Evidence-Based Decision Making to Human Performance

Human performance is ready to step into the age of evidence-based decision making. The state of the human performance field is such that no one can be an expert in all of its diverse subfields, just as no one can be an expert in all, or even most, of the medical specialties. Similarly, practitioners can seldom dedicate the resources to perform an exhaustive literature search to answer time-sensitive operational questions. When they do expend time and effort to answer operational questions, there is little opportunity to generalize and disseminate the findings. A collection of recommendations derived via a documented, traceable, repeatable process provides the bridge to take human performance knowledge into fielded practice, and to capitalize in a tangible way on the human performance discoveries and the research investments made over the past decades.

The five steps of evidence-based medicine[4] can be restated for evidence-based human performance as:

1. Translation of uncertainty to an answerable question, by determining:
   - Scope of the human performance issue;
   - Population(s) of interest; and
   - Study design considerations and identification of variables
2. Systematic retrieval of the best evidence available (literature search)

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3. Critical appraisal of evidence to determine internal validity:
    - Systematic errors as a result of selection bias, information bias, and confounding;
    - Quantitative aspects of baseline determination, intervention, and analysis of results;
    - The effect size associated with intervention;
    - Operational (clinical) applicability of results; and
    - External validity (generalizability to populations of interest)
4. Application of results in practice
5. Evaluation of outcomes, including cost, side effects, and benefits

To implement an evidence-based human performance practice, it is essential to have 1) a panel of experts, both scientific and operational, to evaluate studies and translate research findings into recommendations; 2) "human performance practitioners" who can interpret the evidence base in the context of specific populations and performance goals and conditions, and recommend additional topics derived from operational needs; and 3) researchers to conduct follow-up applied research to continue to refine such practice recommendations.

The recently released Air Force Human Performance Concept of Operations[7] describes these functions in an organizational context for the Air Force Medical Service. As a supporting product, an initial foray into making evidence-based human performance sustainment recommendations, based on the USPSTF procedure and conducted as a proof-of-concept, will be presented at the upcoming AsMA Annual Scientific Meeting. Topics evaluated for the proof-of-concept include shiftwork scheduling to optimize performance, modafinil to mitigate the effect of fatigue on performance, caffeine to mitigate the effect of fatigue on performance, and Functional Movement Screening™ to predict physical-activity-induced injury and/or physical performance. This is a significant step toward making human performance sustainment and enhancement into a defined body of knowledge and an operational practice in the field.

Even during the small proof-of-concept effort, it was clear that the evidence evaluation process generates research recommendations. When human performance topics are nominated from the field, the resulting research recommendations become a field-generated demand signal for research of operational significance. The Cochrane Coalition and the USPSTF processes also result in research recommendations. As in the determination of evidence-based clinical practice recommendations, some topics clearly present insufficient evidence for a firm recommendation. The USPSTF has struggled with how to represent this and how to advise clinical practitioners in these cases.[1,6] In the case of human performance, it may be tempting to conclude that no intervention is the best course of action when evidence is insufficient to support a recommendation, but this is not always possible. For example, in the case of covering a 24/7 operational schedule, shiftwork schedules must be chosen regardless of whether there is good evidence to support one over another.

It is important to note that the studies needed to support the evidence-based practice of human performance are applied research rather than investigational research. These are the kinds of randomized controlled trials, ideally double-blind, which are performed in support of clinical medical interventions. The introduction of pharmaceuticals provide the clearest adherence to this ideal. Such studies are not always possible for human performance interventions. For example, it is not possible for either researchers or subjects to be blinded to shift work schedules intended to improve performance. For field studies it may not be possible to randomize subjects, as some degree of self-selection, for example into morning and evening types, will introduce bias. When it comes to fatigue, probably the most-studied human performance decrement, both the definition of the baseline condition and the identification of covariates are daunting problems.

Another issue to be addressed concerning implementation of evidence-based recommendations is the appearance of a "cookbook" approach that does not take into account the nuances of a particular case. In medicine, physicians are accustomed to tailoring recommendations, but for human performance practice there is neither a specialized educational preparation nor a long history of practice. The human performance practitioner is not yet a defined specialty, medical or otherwise. For that reason, the audience for evidence-based human performance recommendations must be anticipated to be broad and perhaps to include the individual attempting a self-treatment, whether for a perceived performance decrement or for a hoped-for performance enhancement. For the proof-of-concept product mentioned above, the Aerospace Physiologist has been targeted as a human performance practitioner. This creates certain boundaries for the population of interest and for the types of intervention that can be expected, while at the same time defining a practitioner with some common core of educational background and field experience to allow interpretation and tailoring of recommendations.

Evidence-based decision-making can play an influential, positive role in maturing the practice of human performance. A disciplined application of evidence identification, evaluation, and analysis, coupled with effective dissemination and interpretation tools, will better equip both practitioners and researchers to deliver human performance. Utilization of high-quality evidence can inform contemporary operational decision making as well as shape future research initiatives optimizing human performance practices.

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