



Response by the Human Factors and Ergonomics Society

to

NOT-GM-16-104: Request for Information: Approaches for Supporting Team Science in the Biomedical Research Community

June 17, 2016

On behalf of the Human Factors and Ergonomics Society (HFES), thank you for the opportunity to comment on the National Institute of General Medical Sciences (NIGMS) request for information (RFI) on team science. Human factors and ergonomics (HF/E) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and other methods to design in order to optimize human well-being and overall system performance (International Ergonomics Association, 2000). The field of HF/E works to develop safe, effective, and practical human use of technology, particularly by developing scientific approaches for understanding the ways in which humans interact with complex systems, known as “human-systems integration.”

As you may know, HFES is a multidisciplinary professional association with 4,500 individual members worldwide, including psychologists and other scientists, engineers, and designers, all with a common interest in creating safe and effective products, equipment, and systems that maximize and are adapted to human capabilities. HF/E works to develop safe, effective, and practical human use of technology, particularly in challenging settings. HF/E experts, research, and perspectives are vital additions to the national precision medicine dialog.

Interest in Team Science

Today's healthcare challenges, such as finding a cure for cancer, preventing diabetes, implementing behavior change interventions, or the design of medical devices for home use are complex and cannot be viewed from a single lens. Solutions to these challenges extend beyond the single investigator or discipline and require contributions from teams of scientists from multiple disciplines. This is especially true given the increasing diversity of the population who vary in demographic characteristics, abilities, needs and preferences.

HF/E intersects with team science in two main ways: 1) membership on science teams and 2) scholarly work on team effectiveness. In terms of membership, the discipline of human factors is one that is a natural for science teams. Individuals trained in human factors come from multiple disciplines including industrial and systems engineering and psychology. Human factors researchers and professionals also



understand human capabilities and limitations that need to be considered in the development of procedures, systems, or devices that humans are asked to use. Further, they have expertise in how to incorporate user needs and profiles in the design and evaluation process. Science teams that include human factors researchers and health professionals and scientists have become increasingly common and are needed to address biomedical research questions that will impact a human user such as making healthcare decisions, using medical devices, or following medical instructions.

Along these lines, for the last three years the HFES has hosted a successful Human Factors and Ergonomics in Health Care Symposium that brings together human factors researchers and professionals with individuals in the medical community. These meetings help to foster multidisciplinary collaborations. HFES also has a Health Care Technical Group, which is interested in maximizing the contributions of HF/E to medical systems effectiveness and the quality of life of people with illnesses, chronic conditions or disabilities.

Second, the discipline of human factors includes scientists who seek to understand teamwork in various settings in order to improve the effectiveness of teams. There is a large array human factors literature that addresses teamwork (Salas, Cooke, & Rosen, 2008). This literature was cited in the recent National Academies of Sciences, Engineering, and Medicine's report on Enhancing the Effectiveness of Team Science (National Research Council, 2015). This literature speaks to issues of **management and advisory structures in team science, team composition, resources and infrastructure, and assessment of team science**. Much of the research findings led to conclusions and recommendations that can be found in the NRC report. In addition, human factors methods contribute to many of these issues.

For instance, the NRC report concluded that understanding task diversity is important in composing science teams. Task analytic methods in which a task is decomposed into its constituent subtasks and requirements for carrying out subtasks are analyzed was recommended as a systematic way to insure that the science team is covering all of the bases of the task. Task analysis and cognitive task analyses focusing on cognitive, rather than physical tasks are traditional tools of HF/E.

The NRC report also points out that technology for virtual collaboration on science teams is not always easy to use and suggests that human factors be applied to improve the usability of this technology. Usability analysis and evaluation methods can be applied to enhance the effectiveness of tools used for collaboration by science teams.

In sum, the knowledge base of HF/E is central to enhancing science team effectiveness and human factors researchers and professionals are central to science teams in general and biomedicine, specifically.

References

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