

## **Commentaries about Project CoMES**

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Although it is generally recognized that Physical and Rehabilitation Medicine and Physiotherapy are the branches of life sciences with the strongest interaction with physics and biomedical engineering, a wide gap remains between what is known and available from the research arena and what is taught in education programs and used in clinical practice.

Project CoMES made a remarkable effort to reduce this gap by generating a significant amount of on-line teaching material. The second half of the material is particularly oriented to teachers and to the students who wish to pursue teaching and research activities in their future. The material, which is arranged in 10 modules, has been prepared by three physiotherapists and by Prof. R. Merletti. This material commences with basic principles in physics (Modules 1, 2 and 3), introduces the basic concepts of biomedical signal processing and their applications to neuromuscular physiology (Modules 4 and 5) and describes the physiological meaning, the features and the clinical applications of surface electromyography (EMG) (Modules 6-10). This material is free to use and is intended to be made available in physiotherapy undergraduate and postgraduate programs for use by teachers and students.

The user of the 10 Modules is guided from the most elementary concepts of force and torque, velocity and acceleration, electric voltage, current and impedance, to the more sophisticated concepts of spectral analysis, myoelectric manifestations of fatigue, two-dimensional surface EMG amplitude maps and their interpretation. It is not expected that every physiotherapist is familiar with the technique of EMG, however, the number of physiotherapists working in clinical research laboratories, where this background is relevant, is rapidly increasing and is likely to be much more widespread in the coming years. In view of these developments, is important to provide every student with some background on this topic.

The most important message of this work is related to the notion of measurement in rehabilitation and the concept that surface EMG is to physiotherapy what ECG is to cardiology: that is, a tool for measuring progress and changes due to an intervention or associated to some condition. Physiotherapists must take part in the development of the many tools of their trade and this is a relevant example. Hopefully, the same approach will soon be applied to other techniques.

It is interesting to note that the content of the Final Report is not just a summary of the teaching material that is the main “product” of the Project. The report (only some parts are bilingual) is addressing the training of physiotherapists in Italy, the educational material provided by manufacturers, the main books and websites, the main review papers in the field and the encyclopedia items dealing with EMG. Finally, as indicated in the report, it is important that physiotherapists attend international interdisciplinary

congresses and workshops since their role in rehabilitation engineering and technology should be greater than it is today.

Project CoMES is a significant contribution in this direction which hopefully marks the start of further efforts along the same line.

### **Theresa Sukal-Moulton, PT, DPT, PhD**

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It has been a pleasure to serve in an advisory role for the Project CoMES. The task that was undertaken was extensive in the range of topics that are covered within 10 online modules. The end result is both comprehensive and understandable. The concepts are presented in a logical order and build upon one another from basic physics through application.

Although generally relevant to the profession of physical therapy, in personal experience these modules are relevant to my students in Northwestern University Doctor of Physical Therapy (DPT) program. Our DPT students get aspects of this information in different courses (for example, mechanics in kinesiology), but do not have the opportunity in school to apply surface electromyography (sEMG) to clinical or research situations. There is some exposure to scientific articles that utilize sEMG to form scientific conclusions, but unfortunately, the focus is far more on conclusions than critical evaluation of how those conclusions were reached. For the goal of passing the boards, focusing on the conclusions may be efficient – but our students also have the capacity and potential to extend far beyond this. These online modules are a great fit to build competency in sEMG in a systematic and approachable way. A particular strength of the modules is the opportunity to build common language and begin to filter out inappropriate usages of techniques and terms within this arena. PTs can build on this common language and knowledge of techniques to learn ways to evaluate and treat their patients with motor control challenges using sEMG in a reliable and consistent way.

The second step where voice over, exercises to confirm understanding, and self-assessment will be a positive addition to what is currently there. Some of the content is very detailed and many slides have a lot of information on them – so even for the most visual learners having a narration to help guide your eye and thinking about the material presented on the slides will improve comprehension, and therefore, application of these principles.

It's an exciting time for physical therapy, and these modules are a source of reputable continuing education in an accessible technology that stands to improve clinical care moving forward. It will be interesting to see the research questions that are answered using this training.

## **Roberto Gatti, PT, MSc**

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It is a pleasure to comment on the work of Prof. Roberto Merletti et al., relating to the Project CoMES. The ten online modules deal with those elements of mechanical and electronic physics necessary to introduce a student of physiotherapy to the world of instrumental analysis of movement, especially related to surface electromyography, thus somewhat reducing the gap between technological advances and clinical education.

Considering the experience of Prof. Merletti it is of no surprise that the material is presented in a logical order beginning with basic physics and concluding with instrumental applications.

I hope that the material created by Prof. Merletti and his collaborators can be integrated into lectures given by teachers in kinesiology, biomechanics, electrophysiology, etc. in academic physiotherapy programs.

In my teachings of kinesiology (first year students) and kinesiology applied into clinical practice (second year students), I decided to integrate the contents of my teaching with some materials proposed by Project CoMES. For example, the module on *Basic biomechanics* is particularly rich of excellent iconography, and the module *Features and properties of the surface EMG signal* didactically presents concepts that are not simple to grasp.

However, to my mind, an important value of this work is the contribution it makes to help change the belief that physiotherapy can grow without taking into consideration technological progress. A mentality still held by many physiotherapists, especially in Italy.

This tendency may be due to two reasons. The first concerns a typical mindset (common in Italy) which promotes the corporative defence of a position more than collaboration among professionals, where the spread of technologies in clinical practice needs close collaboration among physicians, physiotherapists and rehabilitation engineers, still far from the common mindset.

The second reason is probably the most important and concerns a typical Italian issue: only a few Italian physiotherapy schools offer education in this field. One of the reason is that the management is often made up of teachers who have no specific competences and are not tuned with the scientific progresses in the physiotherapy field.

However, things are changing, the need for modern physiotherapy education is a need of contemporary society and the importance of an inter-professional approach to clinical practice is being recognized. In this direction, the material produced by Project CoMES may contribute to tuning physiotherapy education to the contents emerging from rehabilitation engineering.