Editorial

Translational Medicine and Exercise Prescription (TMEP): Advancing the Era of Exercise Medicine

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“Exercise is medicine” has gained popularity worldwide after the American Medical Association and the American College of Sports Medicine co-launched their ground-breaking health initiative in 2007. This initiative was aimed at improving population health and well-being, mainly by raising the awareness of healthcare providers to regard performing physical activity (PA) as one of the vital signs. Ever since, this concept has spread worldwide and PA has been proposed as an essential part of treatment for chronic diseases. In their pioneering work, Pedersen and Saltin provided compelling evidence for the role of exercise as the first- or second-line therapy for at least 26 diseases. These findings are further corroborated by meta-epidemiological data, indicating exercise interventions to be as effective as drug interventions, such as during rehabilitation after stroke and for the treatment of heart failure. However, the overall effect appears to be strongly correlated with important determinants of the exercise program performed (i.e. dose of training [frequency, volume, intensity], type of exercise and adherence to the training program) and disease-related specifics, thus requiring not only clinical expertise but also an in-depth understanding of exercise physiology and biology.

In this new journal—Translational Medicine and Exercise Prescription (TMEP), we are aiming to bring together the fields of exercise physiology and biology, sports medicine and the science of physical training and testing to bridge the gap between mechanistic research and clinical practice. The journal covers nine sections, including obesity, diabetes, cancer, cardiovascular diseases, neurological and psychiatric diseases, pulmonary diseases, musculoskeletal diseases, endocrine disorders as well as advanced exercise prescription and health maintenance. In this first issue of TMEP, we are delighted to present seven papers from different areas of translational research performed in humans on specific themes related to the treatment and prevention of chronic diseases.

Appropriate selection of primary and secondary endpoints is critical for successfully designing translational studies. In the first paper of this issue, TMEP Section Editor, Jörn Rittweger provides his thoughts on “What Are Good Muscle Endpoints for Translational Studies?” In his important work, he highlights the importance of muscles for our health because of their size, their involvement in energy metabolism and their relevance for locomotion. He further suggests that at least eight different muscle functions are important to health. Well accepted methods exist for three relevant muscular endpoints, namely for power, strength and muscle mass, and these endpoints are utilized in clinical studies. However, such validated methods lack a number of additional muscle functions that are not yet fully scientifically explored. This applies foremost to not only the metabolic functions of muscles, but also to their role in storage and dissipation of mechanical energy. His work concludes by emphasizing how physiological knowledge can be an important base for the guidance of clinical diagnostics.

Following this important message, the group of TMEP Section Editor Pieter de Lange shares their work entitled “Exercise with Energy Restriction as a Means of Losing Body Mass..."
While Preserving Muscle Quality and Ameliorating Co-morbidities: Towards a Therapy for Obesity?”. Obesity and related co-morbidities have reached pandemic proportions worldwide, particularly during the past decade. Therefore, finding effective intervention strategies not only requires scientific focus but these strategies are also of public interest. Based on both human and animal studies, this narrative review summarizes the effects of dietary and exercise-based programs on loss of different body mass components. Furthermore, both the gain and lack of loss of lean mass in view of muscle quality maintenance are discussed and data related to the mechanisms underlying the conservation of functional muscle mass provided. They also provide evidence of the interaction between energy restriction by diet and exercise-induced metabolic demands at the molecular level. This insight into the mechanisms underlines the relevance of translational considerations for personalized exercise prescription.

Obesity and an unhealthy lifestyle are also known to be among the risk factors for type 2 diabetes (T2DM). The research group of TMEP Section Editor Thomas Yates highlights research opportunities and challenges for combining exercise and medical therapies by means of a narrative review entitled “Exercise, Pharmaceutical Therapies and Type 2 Diabetes: Looking beyond Glycemic Control to Whole Body Health and Function”. The authors provide evidence on newer generations of glucose-lowering therapies that also induce concomitant weight loss, particularly on glucagon-like peptide-1 receptor agonists (GLP-1RAs) and sodium-glucose cotransporter 2 inhibitors (SGLT2is). Based on current knowledge, they stress the importance of investigating the interaction or synergy between exercise and other glucose-lowering or weight loss therapies, to make exercise a tailored therapy rather than a generic treatment in the management of T2DM. This review, therefore, clearly highlights the need of precise exercise prescription, originating from an in-depth mechanistic understanding of the effects of exercise.

Cancer is another important metabolic and chronic inflammatory disease that may also be associated with obesity. TMEP Section Editor Jesper F Christensen and Associate Editor Ciaran M Fairman provide a very interesting viewpoint in their article, “Targeted Exercise Training for Cancer Patients: Moving beyond Generic Exercise Guidelines in Clinical Oncology”. This paper aims to update the current knowledge and the clinical rationale for targeted exercise interventions in exercise oncology. Moreover, a framework for systematic guidance of the design and execution of targeted exercise interventions in oncology is presented. The authors hope that their framework can encourage further research into targeted exercise interventions in oncology and may also be used as a guideline for the design of future trials to increase quality and impact.

The group of TMEP Section Editor Helen Dawes, shares their original data in the context of neurological and psychiatric diseases in the article entitled “Physical Activity and Fatigue in Multiple Sclerosis: Secondary Outcomes from a Double-blinded Randomized Controlled Trial of Cocoa Flavonoid Drinks”. In this study, they performed intensive phenotyping of the inter-relationships of the time of day, physical activity levels and fatigue to determine exercise prescription in a group of people with multiple sclerosis (MS) participating in a six-week randomized controlled trial of morning flavonoid intake. It was found that fatigue levels increased during the day and higher levels of fatigue reduced physical activity; yet physical activity itself did not lead to increased fatigue. Additionally, morning cocoa intake reduced daytime fatigue and fatigue related to subsequent physical activity. Therefore, combined prescription of morning exercise and dietary flavonoids may optimize the exercise and physical activity potential in people with MS. This study nicely demonstrates the importance of understanding and considering possible covariants such as nutrition and chronobiology to determine an optimal exercise prescription model.

TMEP Section Editor Jonathan Myers and colleague Baruch Vainshelboim present a narrative review on “Resistance Training for Rehabilitation of Patients with Idiopathic Pulmonary Fibrosis”. In this paper, the pathophysiology and clinical manifestations of Idiopathic Pulmonary Fibrosis (IPF) are summarized with an emphasis on the numerous health and clinical benefits of resistance training among older adults and patients with this respiratory disease. This article effectively explores the potential mechanisms by which systematic resistance training may help overcome exercise limitations in IPF, providing a therapeutic opportunity for rehabilitation. Furthermore, the authors provide important recommendations for pulmonary rehabilitation programs that are based on resistance training for patients with IPF. With this paper, the authors highlight that disease-adapted exercise prescription requires a pathophysiologic understanding to justify the inclusion of specific exercise regimens.

In the final paper of this special issue, the research group of Section Editor Anthony C Hackney shares their original data on the “Energy Availability and RED-S Risk Factors in Competitive, Non-elite Male Endurance Athletes”. This paper particularly emphasizes the entire spectrum of TMEP, that is more than just the most common types of non-communicable diseases, but also includes chronic conditions that may be for example induced by athletic training. In this study, the authors assessed the associations of energy availability and risk factors of relative energy deficiency in sport (RED-S) in 60 competitive, recreationally trained male endurance athletes. They found that hormonal and bone biomarkers were within normal clinical ranges, even when the energy availability was low. The authors

further state that athletes are considered at a high risk for RED-S if their energy availability is low (< 30 kcal/kg FFM), which is based primarily upon research in women. However, the included recreationally trained male endurance athletes were below this criterion but displayed no RED-S symptomology. Thus, the authors suggest that the < 30 kcal/kg FFM criterion may not be a valid categorization for a high risk of RED-S in non-elite male endurance athletes, highlighting the importance of using other criteria.

While the purpose of this first issue is to stimulate further discussion on the topic of translational medicine and exercise prescription from different disciplines, we wish to highlight that these topics are not exhaustive and there are many more questions that must be addressed. With TMEP, we aim to introduce a platform for the transparent dissemination of research findings, where special consideration will be given to novel types of exercise prescriptions, including technology-based intervention approaches as well as mechanism-driven studies with translation to exercise prescription. Moreover, TMEP encourages submissions of “negative findings” and/or possible reports of harmful adverse events (e.g. if trials are terminated prematurely) as long as the quality of the study can be assured (i.e. indicated by relevance/novelty of the question, rigorous methodology, transparency and reproducibility). We strongly encourage submissions from all parts of the world to further improve our understanding on exercise prescription based on mechanistic approaches and by that commence a new era of evidence-based precision exercise medicine.

References