

Sport and Exercise Therapy in Contemporary Health Care – which Competencies are Actually Required

Sport- und Bewegungstherapie in der modernen Gesundheitsversorgung – welche Kompetenzen werden tatsächlich benötigt?

The current debate regarding the exclusive professional jurisdiction of individual health professions over sport and exercise therapy (20) raises a fundamental question that has been discussed within the sport sciences for decades e.g. (3): Which competencies are actually required to provide evidence-based health care through individual and group-based sport and exercise therapy?

The challenges facing contemporary health care have changed fundamentally. Whereas medical care was historically directed primarily towards the treatment of acute diseases, modern health care increasingly focuses on chronic diseases, multimorbidity, the preservation of functional capacity, the improvement of quality of life despite chronic illness, and disease prevention. According to the International Classification of Functioning, Disability and Health (ICF) developed by the World Health Organization (WHO), functional health encompasses not only body functions and structures but also activities, participation, and personal as well as environmental contextual factors (28). Consequently, the preventive, therapeutic, and rehabilitative use of physical activity and exercise training has become an increasingly important component of evidence-based health care (10, 21).

The historical roots of sport and exercise therapy lie in the health- and education-oriented concepts of physical exercise that emerged during the eighteenth and nineteenth centuries, in which structured physical exercise was first systematically implemented in educational institutions and subsequently adopted in medical settings (cf. (4)). The establishment of sport and exercise therapy as a recognised field within the sport sciences can essentially be attributed to the changing epidemiology of disease during the second half of the twentieth century. As health care systems evolved from predominantly curative models towards approaches placing greater emphasis on prevention and health promotion from the 1980s onwards, new opportunities for professionalisation and employment emerged for graduates in sport science (cf. (2)).

As understood today, sport and exercise therapy is founded on a holistic biopsychosocial approach consistent with the WHO definition of health. Internationally, the preventive, therapeutic, and rehabilitative use of sport, physical activity, and exercise training is increasingly promoted under the guiding principle of Exercise is Medicine. The Exercise is Medicine initiative was established in 2007 by the American College

of Sports Medicine and the American Medical Association with the aim of systematically integrating physical activity into health care (1, 24). It is founded on robust scientific evidence demonstrating that exercise training can exert preventive, therapeutic, and restorative effects across a broad spectrum of diseases, ranging from cardiovascular and metabolic disorders to cancer, neurological disorders, musculoskeletal disorders, and mental health conditions (17), with effects that are, in some instances, comparable with – or even superior to – those achieved through pharmacological interventions.

Whereas pharmacological agents generally target a specific biological mechanism, exercise training – the “real polypill” (8) – produces multisystem effects (5). For example, resistance training not only increases muscular strength but also improves bone mineral density, insulin sensitivity, and balance while reducing the risk of falls, among numerous other health benefits (9). In recent years, isometric resistance training has also been recommended in clinical guidelines and meta-analyses as an effective non-pharmacological intervention for the long-term reduction of systolic and diastolic blood pressure (7, 22), with effect sizes that, in some cases, are comparable with those achieved by pharmacological interventions (7). Furthermore, beneficial effects have been demonstrated for psychological well-being, depressive symptoms, health-related quality of life, and social integration (9, 12, 29).

The effectiveness and safety of these interventions, however, depend on disease-specific assessment, precise clinical indication, evidence-based risk stratification, the development of an individualised treatment plan, and the individualised prescription of exercise modality, intensity, volume, and progression.

Sport and exercise therapy therefore extends far beyond the mere improvement of physical performance parameters. As a multidimensional intervention, its objectives extend beyond physiological adaptation to include the development of behavioural competence and self-regulation skills that support a sustained physically active lifestyle, as well as the strengthening of psychosocial resources and social participation (19, 23).

It is precisely this multidimensional character that constitutes one of its defining challenges. Exercise training is not a non-specific intervention but a complex therapeutic modality whose effectiveness depends fundamentally on scientifically sound dosage, individualisation, and adaptation to the specific characteristics of the target population. In ➤

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patients presenting with increased clinical risk, comprehensive monitoring is frequently required. Equally important is the ability to implement scientifically appropriate measures whenever training stimuli prove insufficient or excessive, or when clinically relevant abnormalities become apparent.

Furthermore, successful intervention – particularly in heterogeneous group programmes, but equally in complex personalised training programmes – requires a high level of pedagogical and didactic competence. Practitioners must be able to adapt the conditions under which the intervention is delivered – including the physical environment, timing, rules, therapeutic objectives, and organisational framework – to the specific needs of individual patients. Wearable technologies are also becoming increasingly important as components of monitoring strategies. Their appropriate use requires not only familiarity with their fields of application but also a critical understanding of their potential and their limitations.

As in pharmacotherapy, the benefits and risks of exercise therapy depend not only on selecting the appropriate intervention but also on prescribing the appropriate exercise dosage. Successful therapy likewise requires a holistic biopsychosocial approach that is fully consistent with both the WHO definition of health and the International Classification of Functioning, Disability and Health (ICF) framework (27, 28).

The growing demand for personalised health care will further increase these requirements. Age, biological sex, comorbidities, medication, functional capacity, molecular biomarkers, and interindividual differences in training adaptation all require individually tailored therapeutic concepts. The development of such interventions demands advanced knowledge of biological adaptation processes, exercise physiology, training science, biomechanics, sports medicine, and exercise testing.

From this perspective, the scientific legitimacy of sport and exercise therapy derives not merely from its field of application but, above all, from its independent scientific foundation. Sport and exercise therapy is not simply the application of medical knowledge to physical activity. Rather, it is grounded in the diverse disciplines that have evolved within the sport sciences and have developed their own theoretical frameworks, research approaches, and evidence base over several decades.

Within this framework, the sport science disciplines of training science and exercise physiology, alongside sports medicine, are of particular importance. If exercise is understood as medicine, then training science is the discipline concerned with its dosage and its correct, individualised application. It investigates the mechanisms of biological adaptation to physical loading and develops evidence-based concepts for the planning, regulation, and evaluation of training processes. It also provides the theoretical models and methodological approaches through which the type, intensity, volume, frequency, and progression of physical loading can be individually adjusted to maximise therapeutic effectiveness while minimising potential risks.

Exercise physiology is particularly important with regard to risk assessment and the individual adaptation of exercise interventions. For example, resistance training in patients with complex cardiovascular disease – such as advanced coronary artery disease or following aortic dissection – requires evidence-based regulation of exercise intensity, movement execution, and breathing technique. During high-intensity resistance exercise, inadequate breathing manoeuvres, particularly the Valsalva manoeuvre, may result in substantial transient increases in systolic blood pressure that may pose clinically relevant health risks (13, 15). The safe application of exercise therapy therefore requires advanced knowledge of exercise-physiological adaptation mechanisms.

Similarly, sport science expertise is essential for sport and exercise therapy interventions conducted under different environmental conditions – for example in water, at high altitude, or under conditions of heat stress – as well as across different stages of the lifespan. In all these situations, physiological responses to exercise, potential risks, and the need for programme modifications must be assessed appropriately within their specific environmental and clinical context (16, 18).

Questions relating to exercise dosage, periodisation, individual adaptation, performance development, the long-term maintenance of training effects, and return to sport fall within the core domain of training science. This expertise constitutes an indispensable foundation of contemporary sport and exercise therapy. It is an intrinsic component of the sport sciences and cannot be derived from either medicine or physiotherapy. Rather, it is the product of decades of systematic, internationally recognised, and independent research in sport science, much of it conducted within multidisciplinary and multiprofessional collaborations, including partnerships with psychology, medicine, and even aerospace research.

The same applies to sport biomechanics. It extends far beyond the functional assessment of individual joints or movement patterns and examines the complex mechanical, neuromuscular, and coordinative interactions that characterise human movement under different loading conditions. It provides the scientific foundation for optimising movement quality, load tolerance, and performance development, as well as for the prevention of overuse injuries and musculoskeletal disorders. Contemporary biomechanical methods – from three-dimensional motion analysis and technology-assisted dynamometry to musculoskeletal modelling and artificial intelligence-assisted analytical techniques – are creating increasingly sophisticated opportunities for highly individualised exercise and therapeutic planning.

These scientific disciplines are becoming even more important in the era of personalised medicine. The therapeutic effects of exercise training depend fundamentally on how precisely training stimuli are matched to an individual's biological characteristics. This requires the integration of medical diagnostics with training science models and biomechanical analysis – a competence that can only be acquired through comprehensive academic education at the interface between sport science and medicine.

II

Effective sport and exercise therapy, however, is not confined to the planning and dosage of physical training. Its long-term success depends to a decisive extent on whether patients can be motivated to integrate physical activity permanently into their everyday lives and to continue it independently.

In response to the increasing digitalisation of everyday life, sport science makes an important contribution through both research and education by developing digital training concepts, exergaming programmes, and related innovations. This is particularly important because, especially in the management of chronic diseases, sustainable behaviour change – requiring adaptation to social contextual conditions as well as changes in thinking and a reorientation of an individual's life course – is often the decisive determinant of therapeutic success (6, 11, 23).

In the field of mental health, the therapeutic benefits of physical activity do not depend exclusively on appropriate exercise dosage. Equally important are the motivation with which physical activity is performed and the underlying cognitive and behavi-

oural patterns. Physical activity may, for example, be associated with maladaptive attitudes such as excessive perfectionism or unrealistic performance expectations, thereby maintaining or even exacerbating psychological distress. In certain disorders, physical activity itself constitutes a symptom of the disease, for example in the form of compulsive or excessive exercise behaviour in individuals with anorexia nervosa.

As emphasised by Vella et al. (25), sport and exercise therapy in psychiatry and psychosomatic medicine should therefore not only promote physical activity itself but also take into account patients' individual intentions, underlying cognitive beliefs, and the specific situational context in which physical activity takes place. This enables individuals with mental disorders not only to benefit from the positive physiological effects of regular exercise but also to strengthen their social competencies through participation in group-based exercise programmes. Furthermore, exercise can be used purposefully to improve body awareness, body image, self-esteem, and emotional regulation, while helping to counteract loneliness (14).

These considerations highlight the need to base sport and exercise therapy interventions not only on medical and training science principles but equally on sound psychological, pedagogical, and didactic concepts. Knowledge of motivational psychology, theories of self-regulation and behaviour change, and health-related communication is just as essential as competence in designing individualised learning and training processes. The objective of sport and exercise therapy is therefore not merely the delivery of exercise programmes but the development of behavioural competence, self-efficacy, and physical literacy, thereby enabling individuals to maintain a physically active lifestyle over the long term (23).

Sport science has developed an independent and internationally recognised tradition of research in these fields. Sport psychology, sport sociology, and sport pedagogy provide scientifically grounded concepts for promoting motivation, adherence, group facilitation, competence development, and the transfer of health-promoting behaviours into patients' everyday lives. This expertise constitutes an essential component of academic sport science degree programmes and complements medical and training science knowledge in a manner that is indispensable for the sustainable success of sport and exercise therapy interventions.

Accordingly, contemporary sport and exercise therapy integrates medical, training science, biomechanical, psychological, sociological, health science, and pedagogical expertise into an integrated model of care. It is precisely this multidisciplinary qualification that constitutes its distinctive strength and underpins its independent contribution to personalised, evidence-based, and patient-centred health care.

III

Against the background of the foregoing considerations, it is insufficient to regard sport and exercise therapy merely as an extension or continuation of conventional physiotherapeutic treatment. Rather, it constitutes an independent, science-based health profession whose core competence lies in the biopsychosocial conception, management, and evaluation of complex exercise interventions.

It integrates medical knowledge with the distinctive scientific contributions of training science and sport biomechanics. By incorporating evidence from sport sociology, sport psychology, and sport pedagogy into this body of knowledge, it makes a distinctive contribution to disease prevention, rehabilitation, and long-term health promotion.

A forward-looking health policy should explicitly recognise this scientific independence. The growing importance of Exercise is Medicine® clearly demonstrates that the quality of sport and exercise therapy depends fundamentally on the academic education and expertise of professionals in sport science and sports medicine. Promoting this expertise is therefore not an expression of professional self-interest but an investment in the innovative capacity and evidence-based development of the health care system.

These competencies cannot be acquired through isolated continuing professional development courses. Rather, they are the product of comprehensive university education that integrates sports medicine with expertise in training science and biomechanics, while also providing therapy- and counselling-related competencies in the health sciences, psychology, sociology, pedagogy, and scientific methodology, together with the ability to critically evaluate scientific evidence and translate it into clinical practice.

In this sense, a university degree provides considerably more than knowledge of anatomy, physiology, and disease pathology. It equips graduates with the ability to critically appraise the scientific literature, interpret study designs and statistical findings, generate new scientific knowledge, translate emerging evidence into models of health care delivery, and continuously adapt therapeutic decision-making to advances in scientific research.

Such scientific competence is indispensable in a dynamic field such as sport and exercise therapy, where new developments in precision medicine, digital health technologies, artificial intelligence, and data-driven exercise prescription are emerging at a rapid pace, while health care simultaneously has to adapt its services to increasingly diverse – and in some cases difficult-to-reach – patient populations.

IV

The academisation of the health professions is not an end in itself but a necessary consequence of the increasing complexity of contemporary health care. The German Council of Science and Humanities (Wissenschaftsrat) has likewise emphasised that university-based qualifications are essential to respond to changing health care needs and to ensure the quality of health care provision (26). These considerations apply with particular force to sport and exercise therapy.

Against this background, it appears neither scientifically nor from a health care perspective appropriate to assign responsibility for the therapeutic management of patients exclusively to a single professional group. Contemporary health care should be guided not by claims of professional exclusivity but by competencies. Different health professions contribute distinct scientific perspectives and qualifications that complement one another and, collectively, enhance the quality of health care delivery.

With regard to movement-related interventions, physiotherapy possesses well-established expertise in the management of functional impairments and the restoration of movement function. By contrast, the distinctive strength of sport and exercise therapy lies in the evidence-based development, dosage, and evaluation of individualised and group-based exercise interventions designed to achieve sustained improvements in physical capacity, resilience to physical loading, and social participation. The two professions should therefore be regarded as complementary rather than substitutive.

In summary, the health policy challenges of the coming decades can only be addressed through the systematic strengthening of scientifically grounded and academically qualified health >

professions. Within this framework, sport and exercise therapy fulfils a distinct and indispensable role. A forward-looking health policy should explicitly recognise and support its scientific independence.

This also requires a critical discussion of whether the current regulatory classification of exercise therapy within the health professions still adequately reflects the competencies required in contemporary health care, or whether recognising sport and exercise therapy as an independent regulated health profession

would constitute a logical and appropriate evolution of the health care system.

Health policy should therefore prioritise interprofessional collaboration over professional monopolisation, competency profiles over professional boundaries, and academic qualification over formal jurisdictional debates. Ultimately, the overriding objective must not be the protection of individual professions but the provision of the highest possible standard of evidence-based, personalised, and patient-centred care. ■

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