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The roles of exercise professionals in the health care system: A comparison between Australia and China

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ABSTRACT

Physical inactivity is identified by the World Health Organisation as the fourth risk factor for global mortality and has major implications on the prevalence of non-communicable diseases and general health of the populations. There has been substantial evidence indicating that adequate levels of physical activity, such as prescribed exercise, can be an effective intervention for prevention and treatment of many chronic health conditions, as well as for improvement of mental health, quality of life and well-being. Many countries in the world have developed policies and guidelines for promotion of participation in physical activity and application of prescribed exercise as a means of intervention for chronic health conditions. Subsequently, the roles of exercise professionals in the community and health care system who provide services to the general community members, individuals with various health conditions, as well as elite athletes, and their professional training, qualifications and standards need to be defined and implemented.

This article provides a preliminary comparison of the exercise professionals and their current roles in the community and health care systems between Australia and China (including mainland, Taiwan and Hong Kong, as they have different health care systems), aiming to promote the recognition of exercise professionals in the health care systems, and facilitate the global development of the exercise-related professions, for a healthier world.

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Introduction

Physical inactivity has been identified as the fourth risk factor

for global mortality and has major implications on the prevalence of non-communicable diseases (NCDs) and the general health of the populations.¹ The World Health Organisation (WHO), and governments and professional bodies of many countries have developed policies and guidelines to promote participation in physical activity.^{2–6} There has been substantial evidence indicating that adequate levels of physical activity, such as prescribed exercise, can be an effective intervention for prevention and treatment of many chronic health conditions and NCDs, as well as for improvement of mental health, quality of life and well-being.^{2,7,8}

Although participation in physical activity by generally healthy individuals can be self-directed, there are demands for prescribed exercise for people with specific needs or care, such as older adults, individuals with disability, and patients who require exercise as a

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part of their treatment or rehabilitation for a disease, injury or operation. Therefore, there have been increased demands for specifically trained exercise professionals in the health care system and community.^{9–12}

In response to such demands, professional standards and accreditation systems have been developed in several countries. According to the target populations in which the services are required, the exercise professionals can be categorised as to serve 1) healthy individuals, for promotion of health and fitness and prevention of diseases, such as exercise scientists, personal fitness trainers and social sport instructors; 2) individuals with chronic diseases, post operation or impaired body function, such as clinical exercise physiologists and rehabilitation therapists; and 3) athletes, such as athletic trainers and sport scientists.^{13,14} The titles and accreditation requirements of these exercise professionals may vary or are under construction in the health care system of different countries/regions. For example, accredited (or registered) clinical exercise physiologists have been recognised as one of the allied health professions or health care providers in several western countries, such as Australia, Canada, New Zealand, United Kingdom and United States of America, etc. However, in some Asian countries, such as China, similar roles appear to be undertaken by professionals under different titles, such as exercise/sports rehabilitation therapists, and exercise prescription practitioners, etc.

This article provides a preliminary comparison of the recognised exercise professionals and their current roles in the community and health care systems between Australia and China (including mainland, Taiwan and Hong Kong, as they have different health care systems), aiming to promote the recognition of exercise professionals in the health care systems, and facilitate the global development of the exercise-related professions, for a healthier world.

It should be noted that many medical and allied health practitioners may also prescribe exercise therapy for their clients. They may have various levels of knowledge and skills in prescribing and delivering exercise interventions according to their professional training and accreditation standards. Their roles in the health care system in respect of exercise therapy/intervention are not discussed in this article to reduce the complexity.

Australia

Health care system in Australia

Australia has a population of approximately 25 million and a relatively high quality public health care system¹⁵ that is funded largely through a dedicated component of individual income tax. This is supplemented by an expansive private health care system where the users pay for a voluntary health insurance coverage and an individual fee for service that is variable by type of service and personal preference. In addition, there are separate dedicated funding programs for military veterans, people injured in the course of their work, and those injured in road accidents. The expenditure on health (government and patients voluntary contribution combined) is on par with other OECD nations at approximately 10% of GDP.¹⁶

Chronic diseases are the leading cause of disability and premature death in Australia.¹⁷ The eight leading causes of disease burden are coronary heart disease, back pain and problems, other musculoskeletal conditions, chronic obstructive pulmonary disease, lung cancer, dementia, anxiety disorders and stroke.¹⁸ All of these diseases except lung cancer have good evidence base for a role of exercise in both preventing and managing progression.^{8,19,20} As of 2017, 15% of the Australian population are aged 65 years or older

and this is projected to reach 20% by 2037.¹⁷

The Australian health care system has two main levels of operation: 1) a primary and secondary care level that revolves around what is known as a general practitioner, and 2) a tertiary system of private and public run hospitals. Most health care is provided in the community setting where individuals present to the general practitioner and are managed there or referred (secondary care) to a network of medical specialists (e.g. cardiologists, urologists, etc.) or allied health professionals (e.g. podiatrists, occupational therapists, physiotherapists, etc.).^{21,22} The hospital system is used for acutely unwell people that cannot safely self-manage their condition in their home. Funding and service provision is heavily biased toward acute care, treating disease or subsequent complications as they present. There is some interest in risk factor management and secondary prevention facilitated mostly through the general practitioner. Many clinical guidelines for management of chronic diseases include reference to lifestyle and/or exercise as an important factor; however in practice treatment tends to be biased toward pharmaceutical intervention. The Australian government recognises physical inactivity as a key modifiable risk factor but has no official position on physical fitness as a measure of health or predictor of health outcomes. Furthermore, there is currently no government policy to address the low levels of physical activity across the population.

Exercise professionals in Australia

For healthy populations

A national professional body, Exercise and Sports Science Australia (ESSA), has established professional and accreditation standards for Accredited Exercise Scientists (AES). An AES must have a bachelor qualification from a relevant course, and have the knowledge and skills to apply the science of exercise to develop interventions that improve health, fitness, well-being, performance, and that assist in the prevention of chronic conditions.^{13,23} Almost all sport/exercise/movement science programs of study offered by Australian universities have their courses accredited by ESSA.

There are also Registered Exercise Professionals (AusREPs) which are loosely regulated through other organizations (e.g., Fitness Australia). The AusREPs require the minimum level vocational/technical qualification for category specific registration. They can plan and deliver exercise for low and moderate risk clients as Personal Trainers, Gym Instructors, Group Exercise Instructors or Group Exercise Leaders.²⁴ Registered Exercise Professionals may also deliver exercise programs to higher risk clientele whose conditions are stabilised and managed after receiving documented guidance on the exercise program from the clients' treating medical and/or allied health practitioners.²⁴ These non-university qualifications generally support the practice of exercise delivery and supervision to individual and groups, but lack the deeper theoretical understating required to provide evidence based and specialised prescription and programming to support individual health and performance goals. The lack of health and exercise psychology knowledge and skills are a key omission when considering the need to support positive behavior change. In practice, the populations that the AES and the AusREP qualified practitioners work with tend to be similar but the mode of practice may differ. The AusREPs will work in a 'personal trainer' mode where they will deliver and supervise more standardised programs in group classes or one-on-one supervised training sessions. The AES with the greater depth and breadth of learning will provide a more individualised, goal-oriented exercise program with a behavioral approach that may or may not include regular supervised sessions.

For clinical populations

Since 2006, the Australian government has recognised clinical exercise physiologist as one of the allied health professions who can provide services within the national Medicare system. ESSA is responsible for setting and administering the professional (skills and knowledge) and accreditation (how to qualify) standards of the Accredited Exercise Physiologist (AEP). The AEPs are university qualified through a 4–5 year dedicated degree structure, and are equipped with the knowledge, skills and competencies to design, deliver and evaluate safe and effective exercise interventions for people with acute, sub-acute or chronic medical conditions, injuries or disabilities.¹³

Progressively over the past 20 years the number of AEPs has grown to almost 5000 practitioners across Australia and they have become an integrated part of the health system.²⁵ AEPs now work in most parts of the health system including public and private hospitals; community based primary care; occupational rehabilitation, and veterans health; and medical specialist clinics. The relative numbers of AEPs working in these distinct areas varies across different states (jurisdictions) but the majority of AEP services are conducted from private commercial sites that are dedicated exercise physiology clinics or shared use facilities like community gymnasiums, dedicated rehabilitation centres or physiotherapy clinics.

The great success of this model has led to its continued growth in recognition of the role of AEPs and exercise for health including reference to this role in the majority of clinical guidelines for major chronic diseases. More recently, ESSA has worked with medical groups to recognise the role of exercise in supporting the management of both mental illness and cancer. An important limitation to the system is the fact that AEP interventions are only funded by government or private health insurers for the management of existing chronic diseases, and additionally are typically limited by total cost or number of sessions. This means that individuals are unable to access exercise-related services through the health system to prevent disease even when presenting with significant risk factors. Expert exercise services are well integrated at the management end but more need to be done to support the use of exercise for primary prevention.

For athletes

Australia has also established an accreditation system for professionals engaged in the application of exercise and sport science to enhance performance in elite athletes. Accredited Sports Scientists (ASpS) are typically postgraduate level qualified professionals who provide sports science services and conduct research relating to sport in an elite environment such as the Australian Institute of Sport, state sport academies or professional sport clubs. They help individual athletes and teams to improve their sporting performance through the use of scientific knowledge, methods and applications in the areas of physiology, biomechanics, motor control and motor development, strength and conditioning science, and performance analysis and load monitoring. They evaluate research, and advise on the technical and practical aspects of training, injury prevention, technique, nutritional supplements, performance and recovery practices. Accredited Sports Scientists work at all levels of sport, including with able-bodied and para-athletes.¹³

The Australian Strength and Conditioning Association (ASCA) offers vocational training courses for accreditation of strength and conditioning coaches at four levels that is recognised as a government accredited qualification specific to the practice of strength and conditioning for employment within the recognised sporting structures.²⁶ Thus a sports science practitioner in any sub-discipline (not including those who work purely in research) must be accredited with ESSA to work with elite athletes. However

those who work exclusively in strength and conditioning roles may be accredited with either ESSA or ASCA.

Sports Medicine Australia (SMA) is a peak national multi-disciplinary member organisation that provides leadership in the areas of sports exercise and medicine, sports injury, physical activity, sports exercise and science, and the healthy performance and participation of Australians in physical activity and sport.²⁷ SMA offers vocational training courses for Sports Trainers, Sports Taping, Sports Massage and Concussion Management certifications.²⁷ Sports Trainers have the basic knowledge and skills in management of specific sporting injuries and ability to contribute to safer sporting events and organisations. These qualifications allow people to work with athletes in preventing and managing acute injury through techniques such as massage and taping, but they do not manage athletic training programs or athletic development.

China (mainland)

Health care system in China

China has a population of 1.39 billion at the end of 2017.²⁸ The health care system in China was highly centralised, with the services provided through the public hospital-based system throughout to 1990s. The State Council has rolled out the national health reform since 2009, that focuses on universal basic medical insurance coverage, essential medicine system, primary health care service provision, equitable public health services and public hospital improvements.²⁹ Currently more than 95% of citizens have basic health insurance. There is no referral system in China and most patients go to hospitals directly, although there has been a call for reform to increase the support to community-based primary health care.²⁹

With a fast growing economy and improved living standards during the past decades in China, there is an increasing proportion of older people and growing levels of non-communicable chronic diseases. It is predicted that, by 2020 the number of people aged 60 years and over will increase to around 255 million, accounting for about 17.8% of the total population. The solitary and “empty nest” elderly population will increase to around 118 million, and the dependency ratio of elderly people will rise to about 28%.³⁰ Health survey reports have shown that cardio-cerebral arterial diseases, cancer, and chronic respiratory diseases are the top causes of mortality in 2016; and hypertension (94.24 per thousand), fatty liver (62.78 per thousand), dyslipidemia (38.64 per thousand), diabetes (34.02 per thousand), and chronic gastritis or gastric ulcer (29.27 per thousand) are top chronic diseases in China.³¹ Therefore, the increased elderly population and prevalence of chronic diseases have become the primary concerns in the health system.

In view of these major challenges, the State Council issued the “Healthy China 2030 Plan” in 2016.³² The Plan proposed actions to carry out nation-wide fitness programs; publish physical fitness activities guides; establish an exercise prescription database for various populations, environments and physical conditions; promote the mode of disease management and health service with the combination of physical activity and medicine; and strengthen the positive roles of science-based exercise for fitness in health promotion, prevention of chronic diseases and rehabilitation.³²

To achieve the goals set in the Plan, the sport/exercise/fitness as well as health sciences and relevant industries are facing new challenges, for example, to develop scientific and technological innovation platforms for national fitness; to analyse macro data of national physical health trends; to implement risk assessments for participation in exercise; to prescribe and implement physical activity programs for health in specific populations, such as children and adolescents, women, elderly and disabled; and to establish a

standardised system for appropriate exercise prescription for prevention and treatment of chronic diseases.³²

At present, the health service industry in China can be described as that the people's demand is “hot”, but the service is relatively “cold”. Moreover, there is a shortage of human resources in management of exercise for health.³¹ Particularly, considering the complex (the level of expertise required, evidence-based, individualised) and chronic nature of exercise prescription and its delivery, the task must be carried out by specifically educated and qualified professionals with designated roles and defined responsibilities in the health system and community. Below is a summary of the current education and training required for occupational qualification in the relevant professions in China.

University courses

At present, the graduates of human movement (sport and exercise) science degrees from physical education, education, and medicine or other relevant programs (such as special education and social sports) of higher education institutions are suitable candidates for producing and implementing exercise prescriptions. In response to the demands from the rapid development in the health-related industries, the Ministry of Education has authorised degree programs in exercise rehabilitation since 2004. It is a four-year bachelor degree that combines physical education and rehabilitation medicine, with the physical therapy as the basis and exercise therapy as the primary method, to cultivate professionals in exercise rehabilitation, exercise for promotion of health, and sport injury prevention.^{33,34} The number of programs with “exercise rehabilitation” major approved by the Ministry of Education has quickly increased in the last five years. Up to 2017, there are 72 institutions that offer bachelor degrees in exercise rehabilitation. Among them, 15 are in physical education institutions, 27 in medical institutions, 13 in teacher's (termed as “normal university” in China) institutions, and 17 in multi-disciplinary universities. It has been conservatively predicated that the demand for exercise rehabilitation therapists is over 350,000 in China, however the universities could only produce a few thousands graduates each year, far below the estimated demand.^{34,35}

Based on the degree programs in various types of institutions, there are some differences especially between physical education institutions and medical institutions. The curriculum of exercise rehabilitation in physical education institutions is mainly based on the curriculum of exercise and sport science combined with that of rehabilitation science. The graduates are mainly employed by rehabilitation departments in hospitals, sports research institutions, professional sports teams, community health service centres, and health management companies. The curriculum of exercise rehabilitation in medical institutions mainly focuses on clinical rehabilitation with a component of exercise rehabilitation; and the graduates are mainly employed by rehabilitation departments of hospitals at all levels, sanatorium, and community health service centres.

About the employment prospects, several comprehensive surveys showed following characteristics of the exercise rehabilitation courses.^{34,36}

Graduates of rehabilitation-related majors are normally awarded Bachelor of Science degrees, so even if they can work in hospitals, they can only work as technicians (rehabilitation therapists), but not as medical doctors, according to the current educational and medical administration system in China.

Graduates, either from a medical school or a non-medical school, who wish to work as a rehabilitation therapist in the rehabilitation department of a hospital should get the certificate accredited by the National Health Commission of the People's Republic of China.

The graduates from exercise rehabilitation programs of non-medical schools cannot provide their services in hospitals directly. However, due to the lack of rehabilitation professionals, and the different understanding and implementation of the management regulations, a small number of graduates can still work as rehabilitation therapists in hospitals in some cities, although there is no corresponding qualification certificate. Owing to the problems of status and salary, most of these graduates often quit their jobs after a short period of time. Surveys reported that these graduates are mainly employed by rehabilitation departments in hospitals, sports research institutions, professional sports teams, and rehabilitation physical therapeutic instruments companies.³⁷

To date, the government and relevant professional bodies have been working on accreditation criteria for university courses in this area, but have not recognised the rehabilitation therapists trained by non-medical institutions in the health care system. Therefore, the employment prospect of these graduates from exercise rehabilitation programs is worrisome.

Exercise professionals in China

In China, currently Instructor in Social Sport and Athletic Trainer are the two sport/exercise related professions recognised by the Ministry of Human Resources and Social Security³⁸; and the training and accreditation of Rehabilitation Therapists and Exercise Prescription Practitioners are under development.

For healthy populations

The Instructor in Social Sport is a profession officially recognised by the Ministry of Human Resources and Social Security of China. The social sport instructors work in the fields outside of competitive sports and school physical education sectors. Their roles in the community mainly include: organisation and management of social sport activities; promotion of participation in sport/exercise through seminars and educational activities; conducting social sport research; directing and managing commercial sports facilities; and health and safety management.³⁹

Currently, the social sport instructors do not require a bachelor qualification, although most of the instructors are graduates of Social Sport Instruction and Management degree programs.³⁶ There is a professional grade system (four levels) in this profession. The relationship between the grade system and the professional standards has been debated.⁴⁰ Social sport instructors have been playing an important role in promoting exercise for health, managing social sport/exercise/fitness related facilities and services in community for over two decades. However, whether and how the social sport instructors can contribute to the health care system needs further exploration.⁴¹

Furthermore, there is also a huge demand for fitness/exercise instructors and personal trainers. However, currently there are no universal professional standards and accreditation criteria for these professions in China, although the social sport instructors may have some overlap in these roles.

For clinical populations

Rehabilitation therapists. The roles of Rehabilitation Therapists are to conduct functional assessments for the elderly, children, individuals with “sub-health” and disability, and work out the short-term and longer-term goals of a rehabilitation program, in consultation with the patients and their family members, in order to prescribe a treatment plan according to the individual's condition, for best recovery of their function, and eventually return to the society.⁴² The accreditation certificate of the Rehabilitation Therapist is issued by the National Health Commission and the Ministry of Human Resources and Social Security. In the past, the

qualifications required for entering this profession appear to be inconsistent. In some provinces or regions the applicants are required to have training in medicine, and the graduates from non-medical institutions are prohibited to apply,⁴³ while other provinces do not have such strict restrictions.

About Exercise Rehabilitation Therapists, previously, relevant professional bodies had considered to set up an independent and specific qualification system, but because of great resistance from the current health care system, they now propose to include Exercise Rehabilitation Therapists under the existing category of Rehabilitation Therapy, so that graduates of rehabilitation-related majors (such as exercise rehabilitation) from non-medical schools may become eligible to apply for the qualification certificate of Rehabilitation Therapist and work in hospitals legally. But it is not a smooth progress, and further consultation and discussions are required before the proposal is accepted by the government.

Exercise prescription practitioners. Exercise Prescription Practitioner is a recent development, in response to the “Healthy China 2030 Plan” and “Recommendations for Acceleration of the Development in Sport-Related Consumptions” issued by the government, aiming to strengthening guided sport and exercise, promoting the positive roles of exercise in prevention of diseases and improvement of health. These require specialised professionals who can prescribe appropriate exercise programs for clients under various physical and environment conditions. This profession has not yet been recognised by the Ministry of Human Resources and Social Security. Currently, the professional body, “China Sports Science Society”, is responsible for assessment of the qualification required, however, the professional standards and accreditation system have not been established. Since 2017, several short-term training courses for exercise prescription practitioners have been offered by the China Institute of Sport Science, China Sports Science Society, and Beijing Sport University.

Since the publication of the “Healthy China 2030 Plan” in 2016, a large number of private exercise rehabilitation studios, and some commercial institutions under the banner of “combining sport and medicine”, have rushed into the market. These for-profit institutions largely engage in treatment and rehabilitation of acute or chronic injuries, as well as exercise intervention for chronic diseases. However, there has not been an integrated approach in respect of the professional qualification, standards and accreditation. There exist significant variations in the quality of the services provided, shortage of qualified providers, and imperfection in the management mechanism of this market.⁴⁴

For athletes

Athletic trainers. Athletic Trainer has been officially recognised by the Chinese government in 2015³⁸ although this profession has existed for decades. The roles of athletic trainers are to engage in sports injury prevention and assessment, first aid, and rehabilitation training in sports activities. Its professional scope and management are still under development. At present, only a small number of institutions, such as the General Administration of Sports of China and Shanghai Sport University, have offered relevant training.

In summary, the Chinese government is implementing policies on promoting participation in physical activities for health, establishing professional standards and developing the accreditation system for exercise-related professions and industries. Within this macro environment, the professions of Instructor in Social Sport and Athletic Trainer have been recognised by the government. However, their roles in the health care system and their relationship with other health care professionals (such as Exercise Prescription Practitioner, Rehabilitation Therapist, Physical Therapist,

etc.) in the community require further clarification. The new professions of Exercise Prescription Practitioner, Athletic Trainer, and Rehabilitation Therapist (and Exercise Rehabilitation Therapist) are still under development, in respect of their recognition by the government, their roles in the health care system and their professional accreditation.

Taiwan

Health care system in Taiwan

Taiwan's government is keen in promoting wellness in its rapidly ageing and sedentary population. Chronic diseases that result from unhealthy lifestyles are among the biggest consumers of the National Health Insurance system's budget.⁴⁵ Taiwan has a population of just under 24 million. It is estimated that by the end of 2018 the proportion of people aged over 65 will exceed 14%, achieving the level of “aged society”, and this proportion will be over 20% in 2025, to bring a “super aged society” era.⁴⁶ Therefore, how to postpone the negative effects of ageing, enable people with various physical capabilities to regain their independent living ability, and reduce the relevant social burdens and costs in the health care system, become a very important issue to the government.

The Sports Administration under the Ministry of Education and the Ministry of Health and Welfare are two main government sections to deal with health promotion for all in Taiwan. The Sports Administration devotes itself to integrating sports resources, promoting sports for all, cultivating outstanding athletes, creating well-equipped sports environments, and expanding exchanges with the international community.⁴⁷ On the other hand, the mission of the Ministry of Health and Welfare is to promote health and well-being of all citizens.⁴⁸ The potential clients of the two ministries are somewhat overlapping, while the Sports Administration focuses on healthy people, and the Ministry of Health and Welfare focuses on people with sub-health and disability.

Although many allied health professionals may contribute to health promotion, such as Physical Therapists, Occupational Therapists, Dietitians, and Nurses, there are professionals who are dedicated to promotion and delivery of physical activity and exercise programs. A number of professional organisations offer certifications for exercise and fitness professionals. Below is a brief introduction of the Sport Instructors, Fitness Instructors, and Athletic Trainers in Taiwan. Please note that the titles of these professions may vary in documents published by different government departments and professional bodies in Taiwan and overseas.^{49–53} Exercise professionals who focus on exercise interventions for chronic health conditions, such as clinical exercise physiologists and exercise rehabilitation therapists, have not been officially recognised in the health care system in Taiwan.

Exercise professionals in Taiwan

For healthy populations

Sport instructors. Sport Instructors are professionals who have the ability to instruct exercise according to participants' physiological conditions and needs, properly construct exercise programs, design exercise prescriptions, deliver the program contents, and help participants achieving the set goals of the exercise programs.⁵⁴

In Taiwan, the professional scope of Sports Instructors covers the preparation of various sports games, referees, sport coaches and fitness coaches.⁴⁹ At present, Taiwan's accelerated rate of ageing is more than twice that of European countries and the United States. In response to this challenge, a wave of sports guidance for older adults is emerging,⁵² entering communities and associations to

guide activities such as yoga, aromatherapy, walking and water based exercise.

The professional standards and qualification criteria have not yet been established for the community sport instructors by the government. Meanwhile the Sports Administration has recently run some training courses for the instructors. The courses are open to those who meet one of the following criteria, including: athletes who have previously served in national teams for international games, certified sport coaches in schools, athletes who have previously participated in the national games, graduates from sports related departments (including current year's graduates), professional sports license holders, and sports coaches authenticated and certified by national sports organisations.⁵⁰

Fitness instructors. Physical fitness can be defined as the ability of the body to adapt to life and the environment (e.g., temperature, climate change). People with better physical fitness have better vitality and adaptability in their daily activities or work. The Sports Administration of Ministry of Education has been offering training for fitness instructor certification each year in response to the increasing demand.⁵⁵

Fitness Instructors (including Personal Trainers) are the first line professionals who have the relevant knowledge and skills and can provide participants with exercise-related information and construct safe and effective exercise programs. They should have the ability to deliver and manage one-to-one training courses and motivate participants in exercise, and have passed the certifying examination.⁵⁶ The Sport Administration renamed and updated the "Accreditation Methods of Fitness Instructors" in 2014, with reference to the criteria utilised by the American College of Sports Medicine and the characteristics of Taiwanese populations. There is also a specific certification for the fitness instructors who are mainly working with older adults.⁵²

There are Primary, Intermediate and Senior levels of instructors. The Primary Fitness Instructor does not require a university level of training. Individuals of 20 years of age and older who have graduated from a high school or a higher education program are eligible to be trained for the qualification. The Intermediate Fitness Instructor is qualified by having been a Primary Instructor and with more than one year of exercise guidance experience, or graduated from a Bachelor degree relevant to exercise or sport. The Senior Fitness Instructor is qualified by having been an Intermediate Instructor and with more than three years of exercise guidance experience. The Instructors should hold a valid cardiorespiratory resuscitation certificate.^{55,57}

For clinical populations

In the current health care system in Taiwan, patients with chronic diseases or post operations who require exercise as part of their treatment or rehabilitation, as well as older adults and other individuals with impaired body function, normally obtain their exercise treatment/rehabilitation/care plans from their medical doctors, and are referred to the physical therapists, occupational therapists, dietitians or nurses to implement the plans. Exercise professionals have not been officially recognised in the health care system by the government.

For athletes

Athletic trainers. Athletic Trainer is a part of a sports medicine team who assists in prevention and care of injuries for athletes in competitive sports. Their work mainly includes 1) prevention of sport injuries, 2) health management for sport participants, 3) identification, assessment and on site treatment of an injury, 4) rehabilitation after an injury, and 5) other related tasks authorised by the employment institution.⁵⁸

Individuals who are eligible to apply for accreditation as an athletic trainer include 1) graduates from a college or university level of course in sports medicine, athletic training, or exercise and health related programs, and having completed field internship with 250 valid hours or more; 2) graduates from any discipline at or above college level who have completed courses specified in the athletic trainer accreditation requirements, been granted the certificate, and completed field internship with 250 valid hours or more; 3) individuals who had served as a lecturer of an athletic training program in a college or university prior to December 18th, 2014; and 4) individuals who have obtained athletic trainer certificates in other countries.

Among the above-mentioned professionals, Physical Therapists, Occupational Therapists, Dietitians or Nurses have to pass the examination of Senior Professional and Technical Examinations of the Ministry of Examination. While Sports Instructors, Fitness Instructors and Athletic Trainers have to attend training courses and pass the examinations administered by Sports Administration, Ministry of Education.

Although the exercise professionals, such as Sports Instructors, Fitness Instructors and Athletic Trainers, have completed their professional training courses and internship hours, however there exist discrepancies between the definitions, terminologies, and accreditation criteria between the certifications they have gained from non-governmental organisations and those defined by the Ministry of Examination. Therefore, it has been difficult for exercise professionals to provide their services within the health care system. Significant amount of works are required for Taiwan's government and professional bodies to recognise the roles of exercise professionals and their identification and relationship to the existing medical and allied health professions in the health care system, and educate the public to gain their recognition and trust.

Hong Kong

Health care system in Hong Kong

Hong Kong has a population of just under 7.5 million in 2018 and is a densely populated metropolitan city of about 1106.4 square km of land. It is formerly a British colony and is now a special administrative region of China, handed over from the British government to China in 1997.

Hong Kong follows a dual track medical system of public and private sectors for primary, secondary, and tertiary care. Because of its British influence, Hong Kong health care system combines a universal public health care system with an adherence to Chinese culture,⁵⁹ in which Traditional Chinese Medicine (TCM) is viewed as an alternative way of treatment of illness. However, the majority of people favour western medicine more than TCM in primary care.⁶⁰

The public health sector is headed by the Food and Health Bureau (FHB) of the Hong Kong government for policy formulation, evaluation and resources allocation to ensure that lifelong holistic health care is provided to every Hong Kong citizen and that no one should be denied adequate health care through lack of means. There are two branches that are under its governance: the Department of Health (DH) and the Hospital Authority (HA). The former one deals with management of health while the latter one deals with management of public hospitals. The private sector comprises of hospital care provided by private hospitals, and primary health care provided by private practitioners and private TCM practitioners.

In Hong Kong, primary care is mainly provided by private medical doctors through the private health sector (about 70% of out-patient consultations), while majority of the secondary and tertiary care are provided by the public sector, HA (over 90% of in-

patient services).⁵⁹ Most recently reported health expenditure amounted to \$157,248 million in 2016/17, being 6.2% of GDP.⁶¹ In 2015/16 the health related expenditure took up 21.9% of government's total expenditure, and the public health care services is highly subsidised by the government at around 90% of the total cost with the highest subsidy of 97% for in-patient services.⁶²

In terms of leading causes of deaths in Hong Kong, the top five causes are: (1) malignant neoplasms, (2) pneumonia, (3) diseases of heart, (4) cerebrovascular diseases, and (5) external causes of morbidity and mortality.⁶³ Therefore, chronic illnesses rank high in Hong Kong's burden of diseases and disabilities. On the other hand, Hong Kong has the healthiest persons in the world, ranking at the top in the world for longevity with men and women life expectancy of 81.7 and 87.7 years, respectively.⁶⁴

As in other developed countries/regions, the population of elderly persons (aged 65 and over) in Hong Kong is projected to be more than double in the coming 20 years, from 1.17 million (16% of total population) in 2016 to 2.37 million (31.1%) in 2036 and 2.63 million (34%) in 2066.⁶⁵ Together with low infant mortality rate (1.7 registered deaths per 1,000 live births in 2016) and low fertility rate (1.1 per 1,000 fertility women), the ageing population has caused various challenging demands on the health care system.

Since 2001, Hong Kong government has issued two consultation documents on health care reform: (1) Lifelong Investment in Health,⁶⁶ and (2) First stage: Your Health Your Life,⁶⁷ and Second stage: My Health My Choice.⁶⁸ The government and the community have engaged in the promotion of Healthy Cities project since 1997 which has followed the Healthy Cities movement launched by WHO in 1986. The aim of Healthy Cities is to improve health and quality of life of their resident populations. Healthy Cities projects have been implemented in local districts with funding and support mainly derived from District Councils.

Territory-wide surveillance of physical activity and leisure-time exercise has been conducted through the Behavioural Risk Factor Survey for health-related behaviours among Hong Kong adult population, by the Surveillance and Epidemiology Branch, Centre for Health Protection of the DH.⁶⁹ The survey has been conducted annually since 2004 and has adopted the International Physical Activity Questionnaire short form. Among the 4,071 adults interviewed in 2016, 44% of the respondents' level of physical activity met the WHO's recommended level for adults and over one-third of the respondents reported they engaged in 1–3 times a week for leisure-time exercises.⁶⁹ Hong Kong government has set the policy objective of "Sport for All", to encourage the public to exercise regularly and to promote healthy lifestyle.^{70,71} However, the roles of exercise professionals in achieving the objectives and in the health care system have not been officially defined.

Exercise professionals in Hong Kong

For healthy populations

Only three of the eight universities funded under the University Grants Committee offer degree programs in physical education or sport science. There is no universal accreditation system for exercise professionals in Hong Kong. There are professional bodies from Hong Kong and overseas that offer vocational training and certification courses for personal/fitness trainers. Physical Fitness Association of Hong Kong, China is the only fitness related association affiliated with Sports Federation and Olympic Committee of Hong Kong, China, and their certified instructors are recognised by the government, while other commercial fitness centres have their own freedom to recognise or employ fitness instructors and coaches.

For clinical populations

Currently there are no specific courses offered by tertiary education institutions in Hong Kong on clinical exercise physiology, exercise rehabilitation or exercise prescription that are comparable to those in Australia and mainland China as presented above.

Exercise is Medicine (EIM) is an international programme advocated by the American College of Sports Medicine in 2007, and it has been adopted by more than 40 countries including Australia, China mainland and Hong Kong. In Hong Kong, the overall goals of EIM are to (1) monitor patient's exercise level, (2) prescribe more exercise programmes to people, (3) provide people with counselling in exercise and methods of proper exercise, and (4) refer patients to exercise programs and trainers for patients leading more active lifestyles. EIM initiative calls for physical activity to be included as a standard part of medical treatment and the patient care process (Lobelo et al., 2014). In Hong Kong, it was first initiated by the Physical Fitness Association of Hong Kong, China. They have a coalition of 10+ organisations, including HK Sports Medicine and Sport Sciences Association, for helping the community to achieve more physical activities on a daily basis.

There are medical practitioners and allied health professionals such as nurses, physiotherapists and occupational therapists, chiropractors, and bone setters (who are TCM doctors who help patients with bone and sports injury), etc., who are working for patients with needs in rehabilitation, however they are not specifically trained to prescribe and deliver exercise prescription for prevention and treatment of health conditions.

For athletes

There are sports medicine physicians who are educated with their specialty in sports therapy during their Postgraduate Diploma, Masters, or fellowship training after obtained their residency in medicine. These courses are either a one-year (full time) or two-year (part time) programmes in Hong Kong. The medical practitioners focus on helping patients with sports or bone injuries, and other trauma needs. They often refer patients to physiotherapists for rehabilitation. The majority of sport science-related professionals serving for elite athletes are employed by the Hong Kong Sports Institute. The Institute provides sport science training and support services in fitness and conditioning and performance consultation by sport scientists, sport psychologists, sport biomechanists, sport nutritionists, and services offered by orthopaedic consultations, physiotherapists, Chinese manual therapy, and sports massage.

In Hong Kong, there has been no athletic trainer programme offered by the universities, while a four-year undergraduate degree majoring in Sport Therapy has been offered by a self-funded tertiary education institute. However sport therapy has not been recognised by the health care system in Hong Kong. Also, post-graduate sports trainer courses are offered by the Department of Orthopaedics and Traumatology, Faculty of Medicine, The Chinese University of Hong Kong. The graduates with a Postgraduate Diploma or a Master of Science degree are recognised by the Hong Kong Medical Council and Physiotherapists Board as Quotable Qualifications, and get credit points by a number of medical and allied health societies.

Summary

The comparison of the roles of exercise professionals (outside of generic professions such as physiotherapy, occupational therapy, podiatry, etc.) in the community and health care systems between Australia and China (including mainland, Taiwan and Hong Kong) has identified several similarities and differences (Table 1).

The professional standards and the scope of practice for exercise

Table 1
Roles for exercise and sports science trained practitioners that are formally recognised within the respective government policies or guidelines.

	Australia		China mainland		Taiwan		Hong Kong	
	Qualification	Comments	Qualification	Comments	Qualification	Comments	Qualification	Comments
General Population (healthy)								
Exercise for health and well-being	-	Professional exists but no Government recognition	-	This role is being developed	-	Bachelor qualifications exist but not recognised by Government	-	Bachelor qualifications exist but not recognised by Government
Recreational fitness	-	Professional exists but no Government recognition	NR		VC		VC	
Community sport participation	-		NR		VC		NR	
Primary prevention	-	Professional exists but no Government recognition	-	This role is being developed	-	Bachelor qualifications exist but not recognised by Government	-	
Clinical Populations (existing illness/injury)								
Community based rehabilitation	BA, PG	4 year bachelor minimum	-	This role is being developed	-		-	
Hospital based rehabilitation	BA, PG	4 year bachelor minimum	BA, PG	This role is being reviewed	-		-	
Specialised rehabilitation (e.g. aged care)	BA, PG	4 year bachelor minimum	-	This role is being developed	-		-	
Athletes								
Performance	PG		NR	Usually BA or PG but no formal requirement	NR		BA	
Injury prevention/management	NR		BA, PG	Medical background preferred	VC		VC	

Qualification type: PG – Post Graduate University; BA – Bachelor Degree; VC – Vocational Certification; NR – No specific qualification required.

professionals are clearly defined in Australia. Particularly, the Accredited Exercise Physiologist (AEP) has been recognised as one of the allied health professions in Australian Medicare system. The peak professional body, ESSA, has established an accreditation system for tertiary education training courses and professional qualifications for Accredited Exercise Scientists (AES), Accredited Sport Scientists (ASpS) and AEP. The roles of exercise professionals in relation to the primary, secondary and tertiary levels of health care and a referral system have been well established, although greater efforts in education and promotion are needed to enhance understanding of these roles and the services that AES, ASpS and AEP can provide to the public.

In China, clinical exercise physiology has not been recognised as a profession in the mainland, Taiwan and Hong Kong. Instead, Exercise Prescription Practitioners and Exercise Rehabilitation Therapists are under development in the mainland. They appear to play similar roles as that of the clinical exercise physiologist in western countries. The public preference is normally given to medically trained practitioners and physical therapists in hospitals compared with community health clinics, for their needs in exercise-related treatment or rehabilitation. The importance of exercise to health, fitness, and prevention and treatment of diseases has been recognised and promoted by the government, however, there are still hurdles for non-medically trained exercise professionals to provide their services in the health care system. The professional standards for Exercise Prescription Practitioners and Exercise Rehabilitation Therapists are still to be established.

In mainland China and Taiwan, Social Sport Instructors or Sport Instructors have been recognised by the government. They have been playing important roles in promoting and instructing physical activities in the community. However, their relationship and contribution to the health care system have not been clearly defined. The social sport instructor profession does not exist in

Australia and Hong Kong. The exercise scientists, gym instructors and/or recreational officers in some institutions may have been playing some of the roles as the sport instructors do.

For health care of athletes, there are Sport Trainers or Athletic Trainers, who are working with sport teams or individual athletes for prevention and on-site management of sport injuries and assist in health care of the athletes. These roles are similar in both countries. In Australia, ESSA has recently established professional standards and accreditation criteria for Sport Scientists, who may provide science-based advice to coaches and athletes for performance and health care of athletes. In mainland China, the Athletic Trainer has recently been recognised as a profession by the government, but this appears to still be more aligned to the sports trainer role in injury prevention and management than the role of a sports scientist who implements scientific knowledge and skills in biomechanics, physiology or other areas to analyse and advise training programs for the athletes. Mainland China, Taiwan and Hong Kong all have sports scientists working with elite athletes and sporting teams but at this time the role remains unregulated.

The increasing incidence of chronic illness and preventable disability is a growing societal concern across the world. Participation in safe and acceptable exercise and/or sport is a recognised strategy for preventing and managing most chronic illness. Mainland China has the most well-articulated recognition of the role of physical activity in maintaining a healthy nation and the most well-established community-based support program. There is an existing system for training and employing practitioners to apply exercise in chronic disease management but this area needs expansion and authorities are actively developing new models to support this. Australia has a very well developed and successful model of exercise practitioners in chronic disease management, but lacks policy and services in primary prevention and physical activity participation. Taiwan has a well-structured system of

community sport and fitness instruction but lacks any formal processes in exercise based disease prevention or management. Hong Kong government has set the policy objective of “Sport for All”, to encourage the public to exercise regularly and to promote healthy lifestyle. However, the roles of exercise professionals in achieving the objectives and in the health care system have not been officially defined. There are elements of the Chinese and Australian systems that each country can learn from one another. Collaboration between national professional bodies can aid each government in advancing their respective systems and providing an optimal model of exercise practitioner training, accreditation and employment to maximise the health outcomes across these nations.

Declaration of interest

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Appendix A. Supplementary data

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