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Biokinetics: A South African Health Profession Evolving from Physical Education and Sport

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Abstract

This chapter describes the South African profession of Biokinetics, which operates within the pathogenic and fortogenic health paradigms. Biokinetics is an exercise therapy profession that exclusively prescribes individualised exercise and physical activity for rehabilitation and promotion of health and quality of life. Biokinetics differs from physiotherapy primarily due its management of injuries, illnesses and disabilities within the final-phase of rehabilitation. A brief history of the profession and its scope of profession and its alignment within the South African National Health statutory and professional bodies will be presented. The two pedagogic models adopted for the teaching and training of Biokinetics will also be discussed. Interprofessional collaborative partnerships within the medical-rehabilitation fraternity, sport, health and fitness industries and educational employment opportunities will be reviewed. Finally, the idea of internationalisation of the profession of Biokinetics to similar exercise therapy professions such as Clinical Exercise Physiology and Athletic Training will be presented.

Keywords: Biokinetics, exercise therapy, rehabilitation, health promotion

1. Introduction

The profession of Biokinetics is a specialised discipline of exercise therapy (ET), which emerged from the South African Physical Education Programme. In the 1920s a medical and physical conditioning surveillance report surfaced, which identified South African boys to be in poor health and physical condition [1, 2]. This prompted the South African Defence Force (SADF) to establish the *Physical Training Brigade* in 1934 [1–3]. This specialised

interprofessional medical and rehabilitation collaborative unit addressed the poor medical and physical condition of the boys joining the SADF, via the expertise of medical doctors, dentists, nurses, physiotherapists, occupational therapists, social scientists and physical education instructors. The focus of the South African Physical Education at that time was ergogenic in nature and the research involved was to evaluate and subsequently prescribing performance enhancing exercise or physical activity to improve the physical conditioning of children. This research focused continued until, the late 1960s when a new additional therapeutic focus emerged. The clinical rehabilitative research of Strydom (the salutogenic effects of exercise therapy among coronary heart disease patients) and Buys (the salutogenic effects of exercise therapy among diabetic patients) sowed the seed for the establishment of the profession of Biokinetics [4, 5]. At the Potchefstroom (the PU for CHE, now North-West University), a module on the salutogenic effects of exercise was taught, which was called Kinetiotherapy. The philosophy behind this term reflected the therapeutic benefits of bodily movement (*kinesis*) and the recognition should be sought from health professionals.

Concerted endeavours began in 1969, by the heads of the South African Human Movement Science departments that produced a formal communiqué in 1973, to the then South African Medical and Dental Council to include Kinetiotherapy on its register. However, the registration of this new exercise therapy profession (Kinetiotherapy) was not forthcoming due to resistance from the professions of Physiotherapy, Occupational Therapy and Exercise Science [6, 7]. The initial name of the new exercise therapy profession created considerable tension among its detractors. Biokinetics comprises of two Greek words: “*Bio*” meaning *life* and “*Kinesis*” meaning *movement* [8]. The literal interpretation of Biokinetics is “*life through movement*”. Professor Gert Strydom’s persistent efforts with the South African Medical and Dental Council (SAMDC), finally culminated with the official announcement of the registration of the profession of Biokinetics as a health discipline within the South African Government Gazette on the 9th of September 1983, acknowledged as a profession on the professional board of medical sciences of the South African Medical and Dental Council (SAMDC), which was later renamed the Health Professions Council of South Africa (HPCSA) [7].

2. The scope of profession of Biokinetics

The HPCSA describes Biokinetics as a final-phase functional therapeutic health related profession concerned with enhancing the physical and physiological health status of patients through personalised evaluation and subsequent exercise and human movement prescription in the context of chronic clinical and orthopaedic pathologies and performance enhancement (pathogenic health paradigm) [9]. Biokinetics is also dynamically involved with health and wellness campaigns and the prevention of orthopaedic injury and hypokinetic diseases, advocating salutogenic effects of exercise (fortogenic health paradigm) [10]. The health and wellness campaigns promote the salutogenic effect of exercise to combat non-communicable diseases (NCDs) and their predisposing risks. At this point the biokineticist is working within the pathogenic health paradigm (illness and illness prevention healthcare dimensions). Further biokineticists also promote an active lifestyle as a protective mechanism to prevent the occurrence of NCDs among healthy individuals, working from the fortogenic paradigm.

The orthopaedic rehabilitation focuses primarily on final-phase functional rehabilitation, which entails enhancing muscle strength and endurance, cardiorespiratory fitness, range of motion of joints, neuromuscular proprioception, functional movement patterns and patient education [9]. Muscle strength and endurance have a strong isokinetic and isotonic foci inter alia on both global and local muscles. Range of motion includes enhanced muscle and ligament extensibility, thereby dissipating contractures through passive, active and resisted movements [9].

Clinical rehabilitation of NCDs entails structured rehabilitative programmes aimed to enhance cardiorespiratory fitness, cardio-metabolic profile, range of motion, neuromuscular proprioception thereby improving the patient's quality of life. The following section will describe the interaction of biokineticists within the health dimensions and paradigms (**Figure 1**).

2.1. Health dimensions and health paradigms

The pathogenic paradigm is inclusive of both the ill care dimension (whereby the pathology is present) and/or illness prevention dimension (the elevated intrinsic risk of prospective pathology) (**Figure 2**) [11]. Both health dimensions require clinical interventions by the medical discipline, which include general medical practitioners, nurses, medical specialists (such as cardiologists, endocrinologists and orthopaedic surgeons) and physiotherapists [12]. The fortogenic health paradigm involves the individual, who is apparently healthy, having no elevated intrinsic risk of pathology, but is interested to adopt physical activity regimes to prevent risk of illness and/or illness and increase quality of life. The health dimensions actively intersect each other, and such the respective medical practitioners. This dynamic trespassing between the health paradigms encourages interprofessional collaborations. **Figure 2** provides a graphic representation of the dynamic overlapping of the different health dimensions and the respective healthcare practitioners. The following scenarios describe the potential trespassing among health dimensions and paradigms and practitioners.

- i. Area A displays the intersection of the pathogenic and fortogenic health paradigms, known as the *final-phase rehabilitation*, or *post medical phase* (**Figure 2**). During this phase rehabilitation consists exclusively of physical activity and condition as the primary therapeutic modality. A popular example would be a cardiac patient who is on prescribed

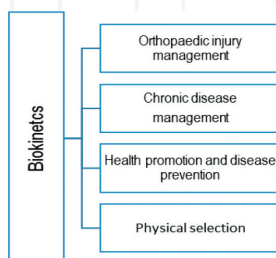


Figure 1. Scope of profession of biokinetics.

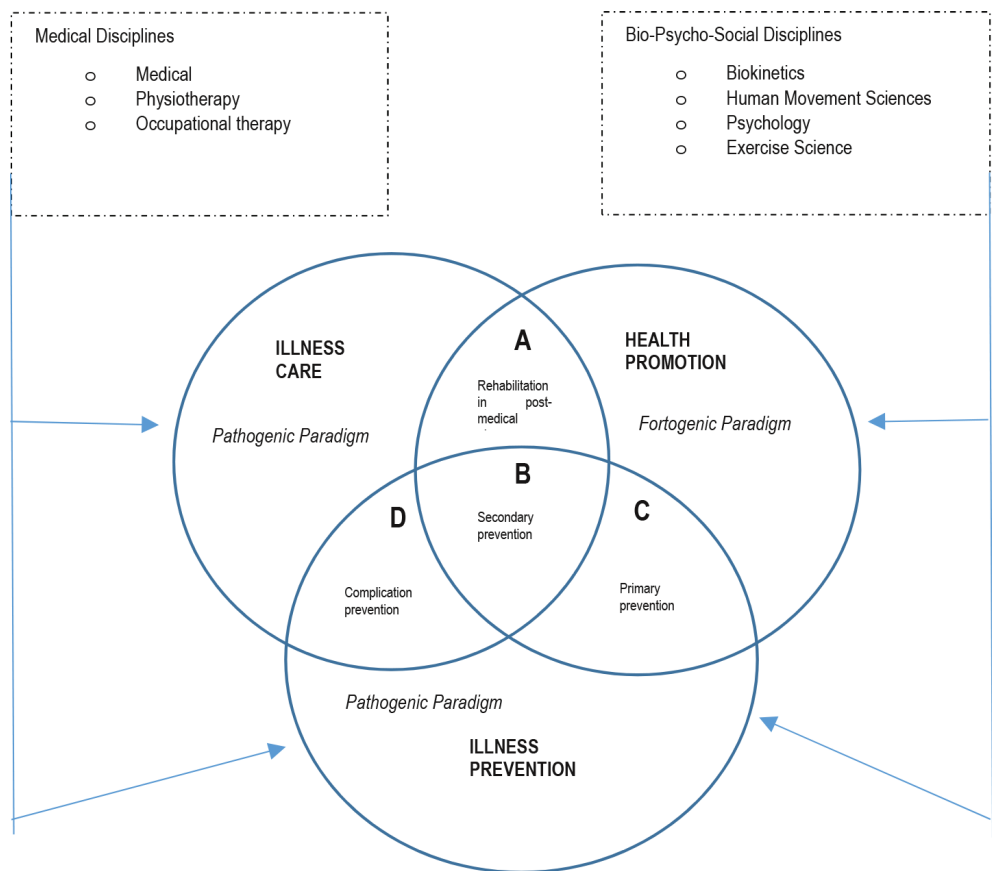


Figure 2. Articulatioin of the health dimensions in the health paradigms [10].

medication, undergone physiotherapy and lastly is referred to biokineticist [11]. The biokineticist aims to enhance the patient's cardiorespiratory function, quality of life and encourage independent living through structured exercise and physical activity.

- ii. Area B is known as *secondary prevention*, where the patient has a pathology, who has underwent medical treatment and/or surgical intervention and has since engaged in final-phase functional rehabilitation (Area A) to prevent the predisposing pathology from deteriorating and/or developing co-morbidities. Referring to the previous example of a cardiac patient who has successfully undergone cardiac surgery, followed by physiotherapy and then the subsequent referral to a biokineticist. The objective of the biokinetic rehabilitation would be to encourage the patient to maintain a physically active lifestyle (within safe guidelines) to avert the recurrence and/or development of co-morbidities. Many cardiac patients are keen to live physically active lifestyles, through the pursuit of enjoyable physically active games and sport (*recreational therapy*) [11]. Biokineticists functioning as recreational therapists prescribe enjoyable games, sport and physical activity regimes to engage

the patient in enjoyable movement simultaneously gaining the health benefits that they would have received from a rigid clinical rehabilitation programme [10]. These patients would need to have regular cardiorespiratory evaluations to determine the status of their cardiorespiratory function and whether the exercise therapy is effective. This interaction forces interprofessional collaboration between cardiologists and exercise therapists.

- iii. Area C refers to instances when a person is healthy, illness free, neither having any pre-disposition to risk of pathology and wants to use physical activity as a proactive protective mechanism against illness and risk of illness (primary prevention). Such individuals seek the expertise of biokineticists to prescribe a physical activity programme to increase their physical conditioning and quality of life.
- iv. Area D known as *complication prevention* occurs, when a patient has no pathology, but is at high risk of developing a pathology due to an unhealthy lifestyle (**Figure 2**). Such a patient would require the prescription of physical activity to diminish the predisposing risk profile. People are subjected to modifiable (excessive alcohol consumption, smoking, diet, physical inactivity and stress) and non-modifiable (age, gender, genetic disposition) risk factors which adversely influence their cardiorespiratory status and cardiometabolic profiles. The salutogenic effect of exercise and movement helps to lower the modifiable risk factors, improves quality of life and prevents premature morbidity and mortality [12]. The patient falls within the illness prevention dimension, which is an extension of the ill care dimension of the pathogenic paradigm. This patient requires the interprofessional collaborative expertise of medical discipline (general practitioners, nurses, medical specialists (such as cardiologists, orthopaedic surgeons and endocrinologists) and physiotherapists) and the bio-psych-social discipline (biokineticists, dieticians and psychologists) [13, 14]. Diabetic patients are common examples of patients who adopt a therapeutic exercise programme to prevent the further metabolic deterioration [15].

3. National statutory and professional bodies

In this section the HPCSA and Biokinetics Association of South Africa (BASA) affiliations of the profession will be reviewed.

3.1. Health Professions Council of South Africa (HPCSA)

The profession of Biokinetics is a health related discipline, which is affiliated to the HPCSA formerly known as the SAMDC. In the late 1990s, the then SAMDC underwent reorganisation, resulting in the formation of 12 health professional boards that are intended to guide the various health professions, as the motto of the HPCSA is *to protect the public and guide the profession* [8, 16]. Health professions with a related scope of profession were congregated under a specific health professional board. In 1998, the Professional Board of Physiotherapy, Podiatry and Biokinetics (PPB) was formulated to safeguard and serve the interest of the public and champion the aforementioned professions consequently [16]. Subsequently, in 1999 the SAMDC changed its name to the Health Professions Council of South Africa (HPCSA) [7, 8, 16].

3.2. Biokinetics Association of South Africa (BASA)

On 17th October 1987 in Potchefstroom, the South African Association of Biokinetics (SAAB) was instituted, with its inaugural office bearers being elected. These office bearers were Prof. G.L. Strydom (President) (Potchefstroom University for Christian Higher Education), Prof. J.M. Loots (Vice-president) (University of Pretoria), Prof. M.F. Coetzee (University of Zululand), Dr. J.F. Cilliers (South African Defence Force), Dr. D. Malan (Potchefstroom University for Christian Higher Education), Ms. M. Delpont (Potchefstroom University for Christian Higher Education) and Mr. H. Daehne (University of Pretoria) [7]. Subsequently, the nomenclature of the SAAB was transformed to the present BASA [8]. The principal purpose of BASA is to serve its constituent biokineticists, intern biokineticists and the student biokineticists-in-training [16]. Annually HPCSA registration of biokineticists is compulsory to gain eligibility to practice. Without HPCSA registration it is a criminal offence for biokineticist to practice. However membership of BASA is optional and the professional can practice, without annual registration but does not enjoy any benefits of the professional association (BASA).

4. Education and training

In this section the two pedagogic models, tertiary training institutions and academic curriculum is presented. Presently, there are two pedagogic models adopted by the 12 South African universities that provide biokinetic training.

4.1. The twin pedagogic models of training

There is the former model (3 + 1 year model) and the new 4 year professional degree. The former Biokinetics degree entailed a three-year undergraduate degree in Human Movement Science or an equivalent (such as Human Kinetics and Ergonomics) followed by a post graduate honours degree specialisation in Biokinetics (3 + 1 year model). During the post graduate year of study, being the student's 4th year, the incumbent begins their 2 years of professional clinical internship [8, 16]. During the post graduate honours year, students are obligated to affiliate with the HPCSA and BASA as a *student biokineticist-in-training*, providing admissibility to commence their professional clinical internship. A *student biokineticist-in-training* is in the process of completing a Biokinetics degree. During the fifth year, the *student biokineticist-in-training* must then affiliate himself/herself with BASA and the HPCSA as an *intern biokineticist* [10]. An *intern biokineticist* is a post graduate student biokineticist who has successfully completed his/her academic university requirement of the Biokinetic degree, but is presently concluding the ultimate year of professional clinical internship. An intern-biokineticist must secure professional clinical internship at either private Biokinetics practices or biokinetics training institutions (universities and SADF), which are endorsed by HPCSA and BASA. Presently, professional clinical biokinetic internship is not accessible in the South African public healthcare sector. During this year, the *intern biokineticist* may receive a salary as per the incumbent's negotiation with the biokineticist providing the clinical internship opportunity.

4.2. Tertiary training institutions

There are many South African Biokinetics tertiary training institutions viz.: the North-West University, University of Venda, University of Johannesburg, University of Free State, University of Pretoria, Tshwane University of Technology, University of Zululand, University of Kwa-Zulu Natal, Nelson Mandela Metropolitan University, University of Stellenbosch, University of Western Cape and the University of Cape Town. The Nelson Mandela Metropolitan University, University of Venda, University of Johannesburg, North-West University and University of Free State have already instituted the new professional 4 year degree, while the other seven tertiary institutions are preparing to follow suit [8].

5. Academic curriculum

Figure 3 illustrates academic curriculum of the 3 + 1 year model.

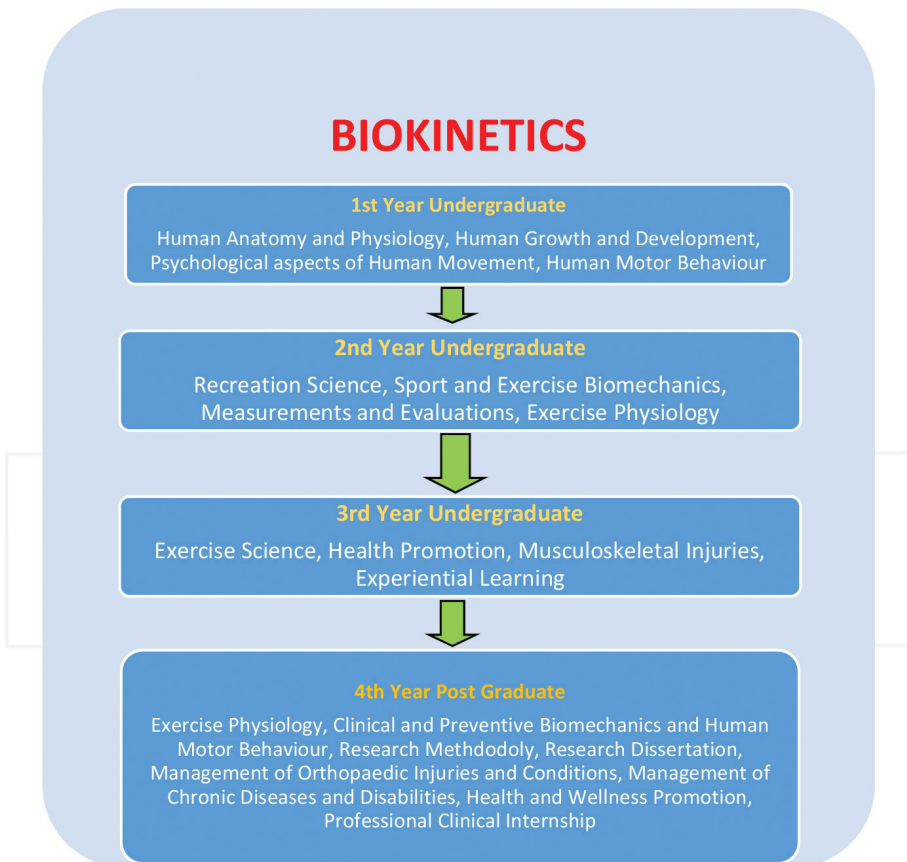


Figure 3. An illustration of the academic curriculum of the Biokinetics: 3 + 1 year model [17].

6. Occupational career opportunities

In the discussion of biokinetic career opportunities national and international prospects will be reviewed.

6.1. National career opportunities

Presently biokineticists are only eligible to practice in the South African private healthcare sector. There are on-going negotiations for biokineticists to be allowed entrance into the public healthcare sector. Despite this challenge, Moss and Lubbe have reported that there is a viable private healthcare biokinetic patient market [18]. South African biokineticists predominantly operate in private biokinetic practices, corporate wellness programmes, private school and the SADF. Private biokinetic practices and biokineticists employed by SADF generally manage the orthopaedic and sport injuries, clinical rehabilitation of NCDs and disabled patients and feverously campaign the salutogenic effects of exercise. Many private schools employ biokineticists to rehabilitate and guide their sport teams, physical educators and sport co-ordinators.

Prominent South African corporate companies have engaged the expertise of biokineticists to manage the health status of their employees, as part of a multidisciplinary medical rehabilitation team [19]. The multidisciplinary team includes medical doctors, nurses, dieticians, occupational therapists, speech and hearing therapists and biokineticists. Large South African companies and their medical insurers have developed medical schemes such as the Med Benefit and Discovery Vitality assessments, aimed towards health and wellness campaigns, which mutually benefit the employers (company), employees (patient) and the medical insurer. Employees receive expert nutritional, exercise and health advice to empower them to adopt a healthier life. The company benefits healthier employees, who are absent less thereby increasing productivity [19, 20]. The medical insurers lessen their financial remuneration to employees/patients who receive biokinetic and occupational rehabilitation to manage NCDs and occupational musculoskeletal related injuries due to the enhanced health of their patients. Large South African companies such as inter alia BMW, ABSA Bank, First National Bank, SASOL, Mondi Unlimited, have established multidisciplinary health and wellness centres at work residence to inspire employees to live healthier lifestyles. These corporations have embraced the salutogenic effect of exercise.

6.2. Present international collaborative relationships between biokinetics and other exercise therapy professions

The following section demonstrate the capability of biokineticists to practice as exercise therapists in other countries, adding value to the health and well-being of society [20, 21]. International career opportunities for biokineticists currently exist in Namibia, Australia, New Zealand, and the United Kingdom as clinical exercise physiologists. Further many biokineticists practice as personal trainers in South Africa, United States of America, Namibia, United Kingdom, Australia and New Zealand.

6.2.1. Namibia

At this time Namibia is the only other country that allows biokineticists to practice as biokineticists. The biokineticist requires a work permit and registration with the Allied Health Professions Council of Namibia (AHPCN) and Biokinetic Association of Namibia (BAN) (AHPCN, 2017, Act 55 of 2004: RN 105 & 106) and completing a compulsory Council examination [22]. These Namibian biokineticists practise in the private sector, among corporate businesses, private practices, health and fitness centres, and schools. Their eligibility to practice in the public healthcare sector is also not yet forthcoming [23].

6.3. Clinical exercise physiology (CEP)

International biokinetic career opportunities exist for biokineticists to practice as *clinical exercise physiologists* in Australia, New Zealand and the United Kingdom. Biokineticists need to attain recognition of prior learning and then complete the respective national entrance board examination. However a clinical exercise physiologist's scope of profession includes the following health care services: (i) chronic disease rehabilitation, (ii) the management of predisposing chronic disease risk factors, (iii) the propagation of an active and healthy lifestyle, (iv) enhancing the ease of elementary daily activities, and (v) fostering continued physical, social, and economic independence [24, 25]. There is no professional biokinetic association in the USA, United Kingdom, Australia or New Zealand, nor is the profession of Biokinetics registered with the respective national health and medical statutory bodies. Ellapen et al. reported that although CEP and Biokinetics share similar educational curricula and management strategies, CEP focuses on the management of NCDs while Biokinetics rehabilitates both clinical pathologies and orthopaedic injuries in the pathogenic paradigm and enhances the quality of life in the fortogenic paradigm [25]. While the scope of profession of CEP is more limited than that of biokineticists, the ability to practice as a CEP nevertheless presents a lucrative opportunity, allowing biokineticists to practice internationally.

6.3.1. Botswana and India

While biokineticists practice in Botswanan private hospitals and corporate businesses, there is however no professional body governing the profession of Biokinetics nor registration with the Botswana Ministry of Health [26]. Marias reported that there is a need for biokinetic rehabilitation in Botswana in order to improve the country's quality of life [27]. Anecdotal reports of Indian and Botswanan universities expressing interest in the profession of Biokinetics have circulated, but no firm steps have been initiated. Collaboration between BASA and the interested universities need to be undertaken so as to create an undergraduate degree in Biokinetics, which, it is hypothesised, will pave the way for the establishment of Indian and Botswanan Biokinetic professional bodies. The registration of these bodies with the respective national health and medical statutory bodies coupled with the formalisation of a national Biokinetic undergraduate programme will in turn create better career opportunities for biokineticists in Botswana and India.

7. Conclusion

Table 1 provides a synopsis of the profession of biokinetics, adopted from Paul et al. [28].


BIOKINETICS	
Professional description	Therapeutic exercise scientist
National emblem of BASA	
Teaching and Learning	
Duration of professional degree	<p>Former model: 4 years (3+1 year model)</p> <p>New vocational model: 4 years</p>
Academic curriculum	Human Anatomy and Physiology, Kinesiology, Biomechanics, Statistics and Research Methods, Rehabilitative Exercises, Administration and First Aid, Aetiology and Rehabilitation of Orthopaedic Injuries, Pathophysiology and Rehabilitation of Hypokinetic Disease, Epidemiology and Salutogenic effects of Exercise
Professional Clinical Internship	
Professional clinical internship	<p>Conducted under the supervision of a registered biokineticist/physiotherapist/medical doctor.</p> <p>In the former model: post graduate honours year (4th year) and the 5th year of mandatory professional clinical internship.</p> <p>New vocational model: starts in the 3rd and 4th year of the degree.</p>
Clinical internship	Orthopaedic, geriatric, cardiac, neuromuscular, muscular rehabilitation, health and wellness campaigns, fitness programme prescriptions and physical ability assessment for workers who undertake hard labour.
Professional and Statutory Affiliations and Requirements	
Statutory and professional bodies	<p>HPCSA (statutory body)</p> <p>BASA (professional body)</p>
Conference	Life through Movement (biennial)
Mandatory CPD	Yes
Career Opportunities	
National	Corporate wellness programmes, South African military, private schools and practices, biokinetic training institutions and high performance centres.
International	<p>Namibia</p> <p>In USA, United Kingdom, Canada and Australia as CEP once the incumbent pass the entrance board examination.</p>

Table 1. Synopsis of the profession of Biokinetics.

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Conflict of interest

There is no conflict of interest.

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