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Muscle Activity scale system

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Abstract. The organization of the muscle allows all the fibers, and thus the fascicles, to contract and relax as a group. **Contraction** is stimulated by nerve impulses and triggers the movement of the muscle, while **relaxation** occurs when the impulse is removed and the muscle relaxes back to its natural state. This pattern of contraction and relaxation is responsible for all the movements in your body .The part of your body that moves in response to a muscle contraction depends on the location and origin point of the muscles themselves. To simplify things, we are going to focus on the skeletal muscles of the body. Most skeletal muscles are attached to bone, cartilage or connective tissue, which limits or directs their movement. For example, a muscle attached to the arm bone will only move the arm bone when stimulated. It cannot move the leg bone; therefore, its movement is determined by its points of attachment. The result of the stimulation of nervous system and contraction of muscle represent the muscle activity which measured by different system. In this project we design simple system to measure the muscle signal in different condition. The biomechanics effect we applied with our practical part that the gate cycle in several cases.The result found with phases of gate cycle in normal walking, up stairs, with lifiting weght , and abnormal person walking.

Keywords: Nanotechnology, Nano-coating, Steam turbine, Turbine blade, Nanoparticles, Nanomaterials, Thermal barrier, Thermal stresses, Thermal experiment, Low-pressure turbine.

1.Introduction

The muscular system consists of all the muscles of the body. The largest percentage of muscles in the muscular system consists of skeletal muscles, which are attached to bones and enable voluntary body movements. There are almost 650 skeletal muscles in the human body, many of them shown in Figure . Besides skeletal muscles, the muscular system also includes cardiac muscle — which makes up the walls of the heart — and smooth muscles, which control movement in other internal organs and structures. (1)

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Figure (1) skeletal muscles [2]

Muscle Structure and Function Muscles are organs composed mainly of muscle cells, which are also called muscle fibers (mainly in skeletal and cardiac muscle) or myocytes (mainly in smooth muscle). Muscle cells are long, thin cells that are specialized for the function of contracting. They contain protein filaments that slide over one another using energy in ATP. The sliding filaments increase the tension in — or shorten the length of
— muscle cells, causing a contraction. Muscle contractions are responsible for virtually all the movements of the body, both inside and out. Skeletal muscles are attached to bones of the skeleton. When these muscles contract, they move the body. They allow us to use our limbs in a variety of ways, from walking to turning cartwheels. Skeletal muscles also maintain posture and help keep balance. Smooth muscles in the walls of blood vessels contract to cause vasoconstriction, which may help conserve body heat. Relaxation of these muscles causes vasodilation, which may help the body lose heat. In the organs of the digestive system, smooth muscles squeeze food through the gastrointestinal tract by contracting in sequence to form a wave of muscle contractions
called peristalsis. Think of squirting toothpaste through a tube by applying pressure in sequence from the bottom of the tube to the top, and you have a good idea of how food is moved by muscles through the digestive system. Peristalsis of smooth muscles also moves urine through the urinary tract. Cardiac muscle tissue is found only in the walls of the heart. When cardiac muscle contracts, it makes the heartbeat. The pumping action of the beating heart keeps blood flowing through the cardiovascular system. (1)

2. Theoretical part:

2.1 Muscle contraction:

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The ability of the human body to move is dependent on the delicate process of muscular contraction, which is coordinated by the interaction of actin and myosin filaments within muscle cells. Understanding these systems is necessary for understanding human physiology.
Acetylcholine release, which is initiated by a nerve impulse, changes the ion permeability of the cell membrane, permitting sodium influx and potassium efflux. The input of sodium causes depolarization, which causes the release of calcium ions that have been stored. These calcium ions link to actin, allowing myosin heads to form cross-bridges and generate force via ATP-fueled conformational changes that lead to muscle contraction.

Understanding the complexity of muscle contraction is essential for comprehending the different physiological and pathological aspects of muscle function and movement.[18]

2.2 Tension of muscle adjusted:

The human body reacts to cold temperatures by producing goosebumps as a result of increased muscular tension. These skin elevations are caused by fragile bulbous structures beneath the skin, despite the practically invisible coating of fine hair. Fine muscles adjacent to these structures contract in response to cold, causing piloerection, or hair erection. This adaptive process retains body heat while extending follicles outward, resulting in small skin protrusions.

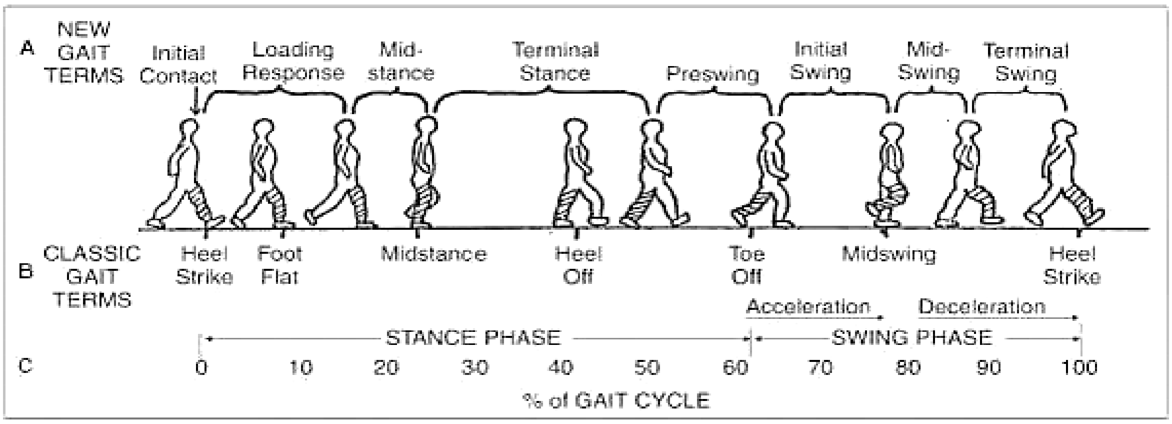
2.3 measure the electrical efficiency of muscles (EMG):

Electromyography (EMG) is a technique to detect muscle activity and monitoring muscle currents through surface or intramuscular electrodes. It assists in determining the cause of pain, muscular spasms, or nerve-related issues, differentiating between muscle and nerve illnesses, and assessing muscle weakening and limitations. Muscle Resting Potential (MRP) denotes muscle effort while at rest, whereas Muscle Action Potential (MAP) denotes muscle movement while active. EMG is important in monitoring muscular performance because it registers the electromagnetic field associated with muscle fibers. EMG is used in physiotherapy, rehabilitation, sports medicine, and biofeedback, in addition to its conventional usage in physiological research. Pre/post-surgical assessment, muscle atrophy prevention, blood circulation enhancement, and muscle re-education for stroke sufferers and incontinence patients are some of its medical applications. EMG-assisted biofeedback allows for real-time monitoring.

2.4 gait cycle:

The gait cycle, defined by the recurrent pattern of steps and strides, separates a step as a single instance of forward movement and a stride as the entire movement cycle. Step time is the amount of time that passes between the heel strike of one leg and the subsequent heel strike of the opposing leg. Step width, on the other hand, defines the mediolateral distance between the feet. When compared to the running cycle, the gait cycle exhibits a longer time span, lower ground response force, and higher velocity. Notably, the gait cycle includes multiple stance phases, which contribute to significant shock absorption, explaining runners' increased vulnerability to overload injuries.
Walking involves the sequential activation of gait orders in the central nervous system, followed by their transmission to the peripheral nervous system, resulting in muscle contraction, variable force generation, and joint force modulation throughout skeletal segments. The gait cycle is divided into two parts: stance (60% of the cycle) and swing (40% of the cycle). Gait execution, in particular, includes complex open and closure chain activities. Another classification divides gait into eight

separate phases: initial contact, loading response, midstance, terminal stance, pre-swing, initial swing, mid swing, and late swing.



Demos, Gait analysis

The gait cycle consists of several separate phases. The heel strike is the first step, in which the heel makes first contact with the ground as the toes are raised. As a result, the foot settles towards the lateral boundary during the midstance phase. The five metatarsophalangeal joints contract to facilitate mobility during the transition from mid-stance to toe-off posture.

The swing phase begins as the stride progresses, spanning the interval between toe-off and heel strike. This phase is broken into two sub-phases: acceleration, which propels the swing leg forward, and deceleration, which regulates forward body movement. The mid-swing phase occurs between these phases, with both feet beneath the body and the heels close together.

Complex anatomical movements occur throughout the gait cycle, such as:

- Controlled hip extension and knee flexion occur during the foot flat phase, with the hip extending by 10°.
- The midstance phase involves coordinated movements in the hip, knee, and ankle, transitioning from force absorption to forward propulsion.
- The heel-off and toe-off phases play a crucial role in redistributing body weight, with the toe-off phase showcasing a knee flexion of 35-40° and an increase in ankle plantar flexion up to 20°.
- Understanding the intricate interplay between these phases is crucial for evaluating the potential impact of various bodily disorders on an individual's overall gait pattern.

3. Results and Discussion

Part 1

1- in one leges with muscle Quadriceps and muscle Hamstrings the sensor in left leg

a-Gait cycle with normal walk

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	251	212	198	279	328	231
Hamstrings	92	70	56	91	88	57

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b-Normal walk with 5kg in the left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	88	152	244	221	243	191
Hamstrings	66	171	234	342	355	244

c-Normal walk with 10kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	297	236	145	163	255	205
Hamstrings	73	87	87	26	65	60

d-Normal walk with 15kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	317	329	300	314	334	330
Hamstrings	499	455	416	433	412	366

e-Normal walk with 5kg in the right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	323	327	322	312	355	368
Hamstrings	315	312	300	307	355	352

f-Normal walk with 10kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	362	312	308	323	330	333
Hamstrings	448	318	308	397	319	324

g-Normal walk with 15kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	170	178	129	186	215	134
Hamstrings	174	192	132	152	150	139

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heel strike phase

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foot flat phase

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Midstance phase

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Heel off phase

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Midswing phase

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2- gait cycle with stair climbing the sensor in left leg
a-stair climbing

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	116	224	214	128	146	139
Hamstrings	227	325	238	231	265	390

b-stair climbing with 5kg in the left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	195	213	215	171	214	153
Hamstrings	255	291	282	263	253	276

c-stair climbing with 10kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	151	212	165	191	245	303
Hamstrings	256	281	216	254	291	250

d-stair climbing walk with 15kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	128	219	231	280	192	244
Hamstrins	312	236	314	285	218	234

e-stair climbing with 5kg in the right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	125	237	195	324	142	205
Hamstrings	157	218	253	112	214	176

f-stair climbing with 10kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Quadriceps	163	512	378	114	221	251
Hamstrings	193	318	200	134	161	250

g-stair climbing walk with 15kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing

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Quadriceps	192	352	590	408	400	619
Hamstrings	183	272	380	357	215	305

foot flat phase

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Toe off phase

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Midswing phase

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Heel off phase

Midstance phase

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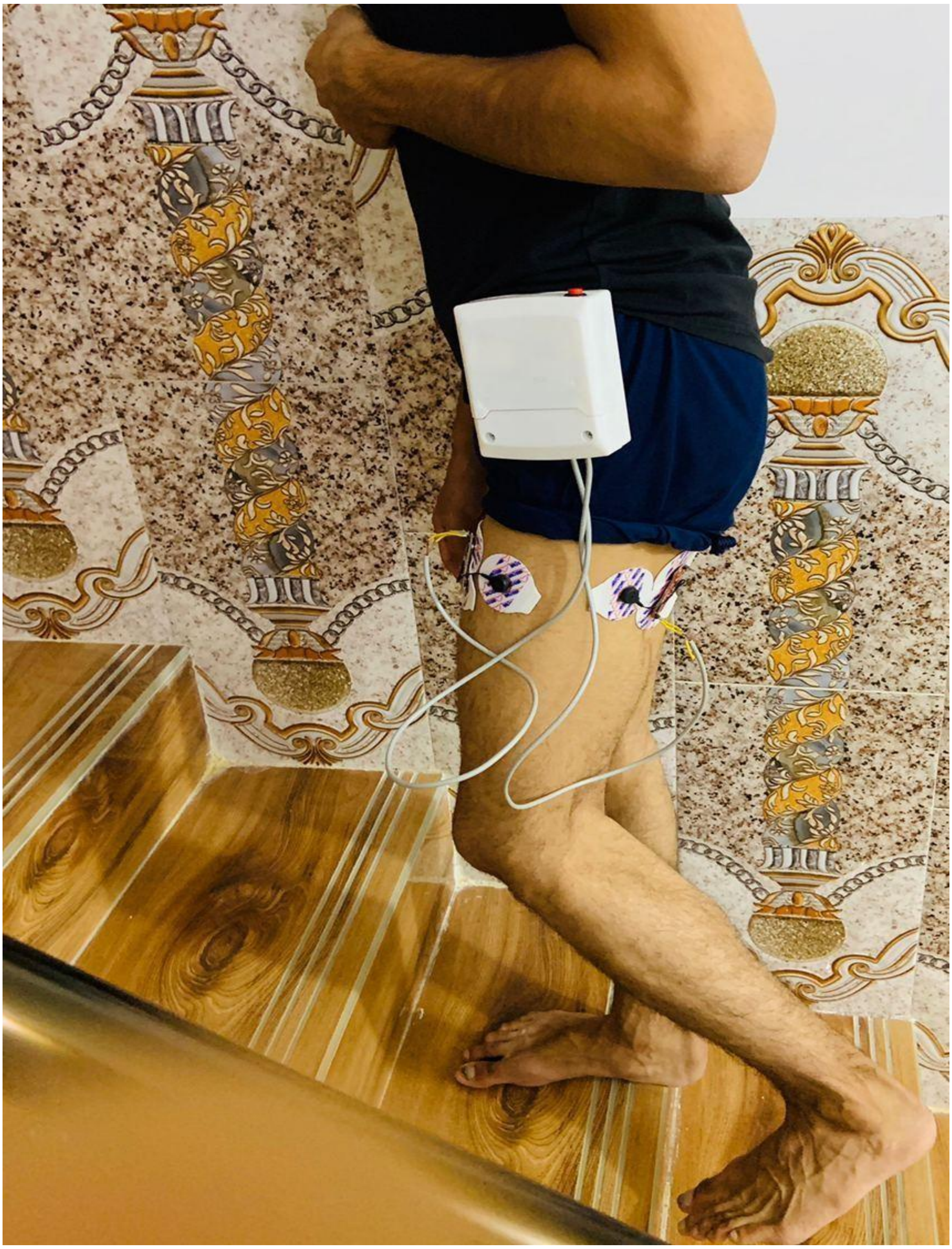

Midstance phase

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heel strike phase

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Part 2

1- in two leges with same muscle the sensores in left and right leges

a-Gait cycle with normal walk

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	198	270	187	203	196	201
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	260	221	210	287	310	224

b-Normal walk with 5kg in the left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	63	171	234	342	355	244
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	89	160	256	210	248	191

c-Normal walk with 10kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	176	272	218	296	253	162
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L .Quadriceps	283	240	168	164	263	212

d-Normal walk with 15kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	337	331	328	304	313	298
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	314	324	308	325	340	340

e-normal walk with 5kg in the right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	340	320	387	324	337	341
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	312	322	325	330	315	376

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f- normal walk with 10kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	338	353	361	328	340	323
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	323	232	314	331	342	348

g- normal walk with 15kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	196	324	151	175	182	147
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	168	177	135	183	230	147

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foot flat phase

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Midstance phase

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Midswing phase

2- gait cycle with stair climbing the sensor in right and left leg
a-stair climbing

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	132	146	149	114	225	128
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	106	218	116	123	138	135

b-stair climbing with 5kg in the left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	170	117	209	180	213	212
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	178	216	228	173	211	175

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c-stair climbing with 10kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	176	245	200	132	221	238
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	141	205	259	189	236	214

d-stair climbing walk with 15kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	174	176	145	142	238	107
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	147	243	119	180	189	158

e-stair climbing with 5kg in the right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	191	155	154	162	129	256
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	197	478	150	239	363	111

f-stair climbing with 10kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	130	150	86	142	117	138
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	196	331	278	278	379	216

g-stair climbing walk with 15kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Quadriceps	132	163	68	126	101	112
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Quadriceps	270	263	326	258	262	157

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part 3
the sensor in left leg
a-Gait cycle with normal walk

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	351	486	474	239	344	320
Triceps	140	210	199	140	182	124

b-Normal walk with 5kg in the left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	449	264	215	260	307	195
Triceps	104	165	181	136	118	108

c-Normal walk with 10kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	368	291	190	116	144	130
Triceps	103	117	143	128	101	96

d-Normal walk with 15kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	503	403	205	120	198	207
Triceps	107	209	187	105	99	102

e-Normal walk with 5kg in the right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	302	478	323	155	122	235
Triceps	93	200	181	110	103	103

f-Normal walk with 10kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	354	428	342	340	257	247
Triceps	95	174	211	105	115	112

g-Normal walk with 15kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	412	359	345	217	188	116
Triceps	97	197	259	106	105	105

2-gait cycle with stair climbing the sensor in left leg
a-stair climbing

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing

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Tibialis	121	221	349	135	128	166
Triceps	94	124	149	121	139	96

b-stair climbing with 5kg in the left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	74	225	357	169	134	186
Triceps	98	130	176	132	175	114

c-stair climbing with 10kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	212	214	394	124	169	102
Triceps	105	102	174	175	168	87

d-stair climbing walk with 15kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	137	246	225	235	195	285
Triceps	114	113	224	318	405	163

e-stair climbing with 5kg in the right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	266	272	379	228	199	168
Triceps	120	147	173	182	291	158

f-stair climbing with 10kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	121	276	527	287	282	202
Triceps	106	147	183	126	389	246

g-stair climbing walk with 15kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
Tibialis	145	445	286	338	214	209
Triceps	109	122	195	210	187	124

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foot flat phase

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Midswing phase

2- in two leges with same muscle the sensores in left and right leges
a- Normal walk

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Triceps	138	141	193	124	120	117
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Triceps	103	200	190	130	124	127

b-Normal walk with 5kg in the left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Triceps	85	202	145	76	162	188
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance

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L. Triceps	105	231	193	167	111	103

c-Normal walk with 10kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Triceps	124	80	177	70	160	190
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L . Triceps	155	181	204	118	140	121

d-Normal walk with 15kg left hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Triceps	88	374	356	98	213	188
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Triceps	100	165	211	125	160	109

e-normal walk with 5kg in the right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Triceps	92	208	292	100	122	128
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Triceps	105	212	231	128	193	124

f- normal walk with 10kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Triceps	106	190	324	80	79	115
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Triceps	107	228	282	130	163	146

g- normal walk with 15kg right hand

Muscle name	heel strike	foot flat	Midstance	Heel off	Toe off	Midswing
R. Triceps	167	140	355	86	135	127
	Heel off	Toe off	Midswing	heel strike	foot flat	Midstance
L. Triceps	100	244	258	110	240	110

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heel strike phase

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Midstance phase

Discussion

Part 1

Quadriceps muscle

a-normal walk

1-Weght in the left hand activity increases with weight gain.

2--Weght in the right hand activity increases with weight gain more than (1).

b- stair climbing

1- Weght in the left hand the activity decreases significantly in the first three stages and increases in the other three.

2- Weght in the right hand the activity increases significantly more than (1) and decreases in some phases.

Part2

a-Normal walk

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R.Quadriceps muscle
1-Weght in the left hand activity increases with weight gain. 2--Weght in the right hand activity same with weight gain.
L. Quadriceps muscle
1-Weght in the left hand activity increases with weight gain. 2--Weght in the right hand activity same with weight gain. b- stair climbing
R.Quadriceps muscle
1- Weght in the left hand the activity increases with weight gain. 2- Weght in the right hand the activity are same with weight gain.

L. Quadriceps muscle
1- Weght in the left hand the activity are same with weight gain. 2- Weght in the left hand the activity increases with weight gain.

Part 3
Tibialis muscle a-normal walk
1-Weght in the left hand activity increases with weight gain.
2--Weght in the left hand activity increases with weight gain less than (1).

b- stair climbing
1- Weght in the left hand activity same with weight gain.
2- Weght in the left hand activity decreases with weight gain. c-comparision between left and right Triceps muscle:
1- weght in the left hand activity increases in left muscle more than right with weight gain.
2-- weght in the right hand activity increases in right muscle more than left with weight gain.

References

1. Suzanne Wakim, M. G. (2020, 6 20). Human_Biology. Retrieved from bio.libretexts:
2. https://bio.libretexts.org/Bookshelves/Human_Biology/Book%3A
3. _Human_Biology_(Wakim_and_Grewal)/15%3A_Muscular_System/15.2%3A_Introduction_to_the_Muscular_System
4. https://www.nlm.nih.gov/exhibition/historicalanatomies/bougle_home.html
5. William C. Shiel Jr., MD, FACP, FACR, (2018), ‘Medical Definition of Muscle’ Medicine Net.
6. Mackenzie, Colin (1918). The Action of Muscles: Including Muscle Rest and Muscle Re-education. England: Paul B. Hoeber. p. 1. Retrieved 18 April 2015.
7. Alfred Carey Carpenter (2007). "Muscle". Anatomy Words. Retrieved 3 October 2012.
8. Douglas Harper (2012). "Muscle". Online Etymology Dictionary. Retrieved 3 October 2012
9. Gray's anatomy : the anatomical basis of clinical practice. Standring, Susan (Forty-first ed.). [Philadelphia]. 2016. ISBN 9780702052309. OCLC 920806541.
10. Close RI. 1972. Dynamic properties of mammalian skeletal muscles. Physiol Rev 52:129– 97.
11. David G. Lloyd Thor F. Besier, (2003). ‘An EMG-driven musculoskeletal model to estimate muscle forces and knee joint moments in vivo’, Journal of Biomechanics, V (36), (6), , pp. (765-776)
12. Guglielminotti P, Merletti R. Effect of electrode location on surface myoelectric signal variables: a simulation study. 9th Int. Congress of ISEK 1992; Florence, Italy.
13. Laterza F, Olmo G. Analysis of EMG signals by means of the matched wavelet transform.

Electronics Letters. 1997;33(5):357–359.
14. Gabor D. Theory of communication. J Inst Elect Eng. 1946;93:429–457
15. Ismail AR, Asfour SS. Continuous wavelet transform application to EMG signals during human gait. Thirty-Second Asilomar Conference on Signals, Systems & Computers 1998; 1:325-329.
16. Loudon J, et al. The clinical orthopedic assessment guide. 2nd ed. Kansas: Human Kinetics, 2008. p.395-408.
17. Subotnick S. Sports medicine of the lower extremity. Harcourt (USA):Churchill Livingstone, 1999.
18. Shultz SJ et al. Examination of musculoskeletal injuries. 2nd ed, North Carolina: Human Kinetics, 2005. p55-60.
19. Berger W, et al. J Physiol 1984;357: 109-125.
20. Cavanagh PR, Komi PV. 1979. Electromechanical delay in human skeletal muscle under concentric and eccentric contractions. Eur J Appl Physiol Occup Physiol 42:159–63.
21. -Farina D, Merletti R, Enoka RM. 2004. The extraction of neural strategies from the surface EMG. J Appl Physiol 96:1486–95.
22. Konow N, Camp A, Sanford C. 2008. Congruence between muscle activity and kinematics in a convergently derived prey- processing behavior. Int Comp Biol. doi: 10.1093/icb/icn045.
23. Biomechanics, actuation, and multi-level control strategies of power- augmentation lower extremity exoskeletons: an overview - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Divisions-of-gait-cycle-with-typical- muscle-activity-patterns-50-51-The-gluteus_fig1_330917511 [accessed 29 Jun, 2020]
24. M. Bogdan and D. Zasada, "Józef Błachnio Mariusz Bogdan Dariusz Zasada Increased temperature impact on durability of gas turbine blades Wpływ podwyższonej temperatury na trwałość łopatek turbiny gazowej *," vol. 19, no. 1, pp. 48–53, 2017.
25. N. Asok Kumar and S. R. Kale, "Numerical simulation of steady state heat transfer in a ceramic-coated gas turbine blade," *Int. J. Heat Mass Transf.*, vol. 45, no. 24, pp. 4831–4845, 2002, doi:10.1016/S0017-9310(02)00190-4.
26. Y. Gao, J. Gao, and D. Yang, "Equiaxed and porous thermal barrier coatings deposited by atmospheric plasma spray using a nanoparticles powder," *Adv. Eng. Mater.*, vol. 16, no. 4, pp.406–412, 2014, doi: 10.1002/adem.201300284.
27. Y. Fedorova *et al.*, "NU SC," *Surf. Coat. Technol.*, 2015, doi: 10.1016/j.surfcoat.2015.11.054.
28. J. H. Liu, Y. B. Liu, X. He, and L. Liu, "Study on TBCs insulation characteristics of a turbine blade under serving conditions," *Case Stud. Therm. Eng.*, vol. 8, pp. 250–259, 2016, doi: 10.1016/j.csite.2016.08.004.
29. C. Joshi, A. L. Rufus, S. Suresh, P. Chandramohan, S. Rangarajan, and S. Velmurugan, "Characterization of the oxide formed in the presence of poly acrylic acid over the steam generator structural materials of nuclear power plants," *J. Nucl. Mater.*, vol. 437, no. 1–3, pp. 139–148, 2013, doi: 10.1016/j.jnucmat.2013.01.353.
30. N. Gat and O. Systems, "DocuServe," no. July 1980, 2016, doi: 10.1520/JTE11610J.
31. Hamed, "Temperature Effect on Particle Dynamics and Erosion in Radial," vol. 110, no. April 1988, 2017.
32. V. Shanov, W. Tabakoff, and R. N. Singh, "CVD Diamond Coating for Erosion Protection at Elevated Temperatures," vol. 11, no. April, pp. 220–225, 2002.
33. J. A. R. Babu, K. K. Kumar, and S. S. Rao, "State-of-art review on hybrid nanofluids State-of-art review on hybrid nano fl uids," *Renew. Sustain. Energy Rev.*, vol. 77, no. October, pp. 551–

565, 2017, [Online]. Available: http://dx.doi.org/10.1016/j.rser.2017.04.040.
34. M. Liu, M. C. Lin, I. Huang, and C. Wang, "Enhancement of thermal conductivity with carbon nanotube for nanofluids B," vol. 32, pp. 1202–1210, 2005, doi: 10.1016/j.icheatmasstransfer.2005.05.005.
35. N. A. Che Sidik, I. M. Adamu, and M. Mahmud Jamil, "Preparation Methods and Thermal Performance of Hybrid Nanofluids," *J. Adv. Res. Appl. Mech.*, vol. 66, no. 1, pp. 7–16, 2020, doi: 10.37934/aram.66.1.716.
36. W. Yu and H. Xie, "A review on nanofluids: Preparation, stability mechanisms, and applications," *J. Nanomater.*, vol. 2012, 2012, doi: 10.1155/2012/435873.
37. K. A. S. Al-saadie and H. A. Y. Al-mashhdani, "Corrosion Protection Study for Caron Steel in Seawater by Coating with SiC and ZrO 2 Nanoparticles," vol. 5, no. 1, pp. 28–39, 2015, doi: 10.5923/j.chemistry.20150501.05.