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LAMPIRAN

Lampiran 1. Surat Izin Penelitian Tingkat Provinsi

PEMERINTAH PROVINSI SULAWESI SELATAN

DINAS PENANAMAN MODAL DAN PELAYANAN TERPADU SATU PINTU

Jl.Bougenville No.5 Telp. (0411) 441077 Fax. (0411) 448936
Website : http://simap-new.sulselprov.go.id Email : ptsp@sulselprov.go.id
Makassar 90231

Nomor	:	**15622/S.01/PTSP/2023**
Lampiran	:	-
Perihal	:	**Izin penelitian**

Kepada Yth.
Kepala Dinas Pemberdayaan Perempuan Perlindungan Anak, Pengendalian Penduduk dan KB Prov. Sulsel

di-
Tempat

Berdasarkan surat Dekan Fak. Keperawatan Univ. Hasanuddin Makassar Nomor : 1252/UN4.18.1/PT.01.04/2023 tanggal 11 April 2023 perihal tersebut diatas, mahasiswa/peneliti dibawah ini:

N a m a	:	**WINDA MEYZULVINA**
Nomor Pokok	:	R021191007
Program Studi	:	Fisioterapi
Pekerjaan/Lembaga	:	Mahasiswa (S1)
Alamat	:	Jl. P. Kemerdekaan Km. 10 Makassar

Bermaksud untuk melakukan penelitian di daerah/kantor saudara dalam rangka menyusun SKRIPSI, dengan judul :

" HUBUNGAN ANTARA MOBILITAS METATARSOPHALANGEAL I DENGAN POLA BERJALAN PADA PEGAWAI WANITA DI KANTOR GUBERNUR SULAWESI SELATAN "

Yang akan dilaksanakan dari : Tgl. ***28 April s/d 28 Mei 2023***

Sehubungan dengan hal tersebut diatas, pada prinsipnya kami ***menyetujui*** kegiatan dimaksud dengan ketentuan yang tertera di belakang surat izin penelitian.

Demikian Surat Keterangan ini diberikan agar dipergunakan sebagaimana mestinya.

Diterbitkan di Makassar
Pada Tanggal 16 April 2023

A.n. GUBERNUR SULAWESI SELATAN
KEPALA DINAS PENANAMAN MODAL DAN PELAYANAN TERPADU SATU PINTU PROVINSI SULAWESI SELATAN

Ir. H. SULKAF S LATIEF, M.M.
Pangkat : PEMBINA UTAMA MADYA
Nip : 19630424 198903 1 010

Tembusan Yth
1. Dekan Fak. Keperawatan Univ. Hasanuddin Makassar di Makassar;
2. *Pertinggal.*

Lampiran 2. Surat Keterangan Persetujuan Etik

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN
RISET, DAN TEKNOLOGI
UNIVERSITAS HASANUDDIN
FAKULTAS KESEHATAN MASYARAKAT
Jln.Perintis Kemerdekaan Km.10 Makassar 90245, Telp.(0411) 585658,
E-mail : fkm.unhas@gmail.com, website: https/fkm.unhas.ac.id/

REKOMENDASI PERSETUJUAN ETIK
Nomor : **: 3343/UN4.14.1/TP.01.02/2023**

Tanggal : 18 April 2023

Dengan ini Menyatakan bahwa Protokol dan Dokumen yang Berhubungan dengan Protokol berikut ini telah mendapatkan Persetujuan Etik :

No.Protokol	10423091070	No. Sponsor Protokol	
Peneliti Utama	**Winda Meyzulvina**	Sponsor	**Pribadi**
Judul Peneliti	**Hubungan antara *Mobilitas Metatarsophalangeal I* dengan Pola Berjalan pada Pegawai Wanita di Kantor Gubernur Sulawesi Selatan**		
No.Versi Protokol	1	Tanggal Versi	10 April 2023
No.Versi PSP	1	Tanggal Versi	10 April 2023
Tempat Penelitian	**Kantor Gubernur Sulawesi Selatan**		
Judul Review	[x] Exempted [ ] Expedited [ ] Fullboard	Masa Berlaku **18 April 2023 Sampai 18 April 2024**	Frekuensi review lanjutan
Ketua Komisi Etik Penelitian	Nama : Prof.dr.Veni Hadju,M.Sc,Ph.D	Tanda tangan	Tanggal 18 April 2023
Sekretaris komisi Etik Penelitian	Nama : Dr. Wahiduddin, SKM.,M.Kes	Tanda tangan	Tanggal 18 April 2023

Kewajiban Peneliti Utama :

1. Menyerahkan Amandemen Protokol untuk persetujuan sebelum di implementasikan
2. Menyerahkan Laporan SAE ke Komisi Etik dalam 24 Jam dan dilengkapi dalam 7 hari dan Lapor SUSAR dalam 72 Jam setelah Peneliti Utama menerima laporan
3. Menyerahkan Laporan Kemajuan (progress report) setiap 6 bulan untuk penelitian resiko tinggi dan setiap setahun untuk penelitian resiko rendah
4. Menyerahkan laporan akhir setelah Penelitian berakhir
5. Melaporakn penyimpangan dari protocol yang disetujui (protocol deviation/violation)
6. Mematuhi semua peraturan yang ditentukan

Lampiran 3. Surat Telah Menyelesaikan Penelitian

PEMERINTAH PROVINSI SULAWESI SELATAN

DINAS PEMBERDAYAAN PEREMPUAN, PERLINDUNGAN ANAK, PENGENDALIAN PENDUDUK, DAN KELUARGA BERENCANA

Jalan Jenderal Urip Sumoharjo No. 269 Makassar, Telepon (0411) 424780, 453187, Ext. 8903 Fax 0411-424780
MAKASSAR 90231

SURAT KETERANGAN
Nomor : 079 / 377 / DP3A DALDUK KB

Yang bertanda tangan dibawah ini :

Nama	: Hj. Aryani Aruji, S.E., M.M
NIP	: 19670527 199203 2 008
Pangkat / Gol.	: Pembina Tk. 1/ IVb
Jabatan	: Sekretaris Dinas Pemberdayaan Perempuan, Perlindungan Anak, Pengendalian Penduduk, dan Keluarga Berencana

Dengan menerangkan bahwa yang tersebut namanya di bawah ini :

Nama	: **WINDA MEYZULVINA**
NPM/ NIM	: R021191007
Program Studi	: S1 Fisioterapi Fakultas Keperawatan
Sekolah/Kampus	: Universitas Hasanuddin Makassar

Benar telah selesai melaksanakan Penelitian/ Pengumpulan Data yang dilaksanakan pada tanggal 09 s/d 15 Mei 2023 pada Dinas Pemberdayaan Perempuan, Perlindungan Anak, Pengendalian Penduduk, dan Keluarga Berencana Kantor Gubernur Provinsi Sulawesi Selatan dalam rangka penyelesaian Skripsi dengan judul Penelitian ***"Hubungan antara Mobilitas Metatarsophalangeal I dengan Pola Berjalan pada Pegawai Wanita di Kantor Gubernur Sulawesi Selatan."***

Demikian surat keterangan ini diberikan untuk pergunakan sebagaimana semestinya.

Makassar, 17 Mei 2023
Sekretaris Dinas

Hj. Aryani Aruji, S.E., M.M.
Pangkat : Pembina Tk.1, IV/b
NIP : 19670527 199203 2 008

Lampiran 4. Hasil Spss
Frekuensi Karakteristik

Usia

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	22-29	23	46.0	46.0	46.0
	30-37	7	14.0	14.0	60.0
	38-45	5	10.0	10.0	70.0
	46-53	6	12.0	12.0	82.0
	54-61	9	18.0	18.0	100.0
	Total	50	100.0	100.0	

Tinggi Badan

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	142-149	10	20.0	20.0	20.0
	150-157	27	54.0	54.0	74.0
	158-165	12	24.0	24.0	98.0
	166-173	1	2.0	2.0	100.0
	Total	50	100.0	100.0	

Berat Badan

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	40-47	6	12.0	12.0	12.0
	48-55	15	30.0	30.0	42.0
	56-63	17	34.0	34.0	76.0
	64-71	9	18.0	18.0	94.0
	72-79	3	6.0	6.0	100.0
	Total	50	100.0	100.0	

Distribusi Variabel

Dorsofleksi Dextra

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	restricted	36	72.0	72.0	72.0
	normal	14	28.0	28.0	100.0
	Total	50	100.0	100.0	

Report

Usia

dorsofleksi dextra kode	Mean	N	Std. Deviation	Minimum	Maximum	Median
restricted	34.61	36	10.981	22	57	29.50
normal	43.14	14	13.341	26	57	50.50
Total	37.00	50	12.179	22	57	31.50

Dorsofleksi Sinistra

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	restricted	40	80.0	80.0	80.0
	normal	10	20.0	20.0	100.0
	Total	50	100.0	100.0	

Report

Usia

dorsofleksi sinistra kode	Mean	N	Std. Deviation	Minimum
restricted	34.95	40	11.556	22
normal	45.20	10	11.641	27
Total	37.00	50	12.179	22

Tinggi badan

dorsofleksi sinistra kode	Mean	N	Std. Deviation	Minimum
restricted	154.05	40	5.053	142
normal	154.40	10	4.526	147
Total	154.12	50	4.910	142

berat badan

dorsofleksi sinistra kode	Mean	N	Std. Deviation	Minimum
restricted	56.58	40	8.747	40
normal	59.40	10	8.859	46
Total	57.14	50	8.753	40

Plantarfleksi Dextra

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	restricted	37	74.0	74.0	74.0

	normal	13	26.0	26.0	100.0
	Total	50	100.0	100.0	

Report

Usia

plantarfleksi dextra kode	Mean	N	Std. Deviation	Minimum	Maximum	Median
restricted	36.03	37	11.642	22	57	30.00
normal	39.77	13	13.706	24	57	32.00
Total	37.00	50	12.179	22	57	31.50

Plantarfleksi Sinistra

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	restricted	41	82.0	82.0	82.0
	normal	9	18.0	18.0	100.0
	Total	50	100.0	100.0	

Report

Usia

plantarfleksi sinistra kode	Mean	N	Std. Deviation	Minimum	Maximum	Median
restricted	35.90	41	11.794	22	57	29.00
normal	42.00	9	13.370	26	57	41.00
Total	37.00	50	12.179	22	57	31.50

Tinggi badan

plantarfleksi sinistra kode	Mean	N	Std. Deviation	Minimum	Maximum	Median
restricted	153.83	41	5.133	142	167	155.00
normal	155.44	9	3.678	152	162	154.00
Total	154.12	50	4.910	142	167	154.50

berat badan

plantarfleksi sinistra kode	Mean	N	Std. Deviation	Minimum	Maximum	Median
restricted	56.68	41	9.084	40	75	56.00
normal	59.22	9	7.120	46	70	58.00
Total	57.14	50	8.753	40	75	57.00

step

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	tidak normal	50	100.0	100.0	100.0

stride

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	tidak normal	50	100.0	100.0	100.0

Cadance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	normal	24	48.0	48.0	48.0
	tidak normal	26	52.0	52.0	100.0
	Total	50	100.0	100.0	

speed

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	tidak normal	50	100.0	100.0	100.0

Hasil Korelasi *Independen* dan *dependen*

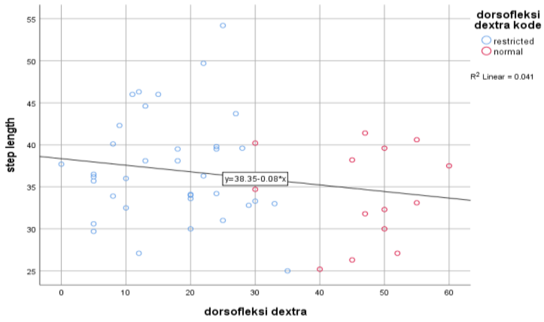
Correlations

			Dorsofleksi Dextra	Plantarfleksi Dextra	Dorsofleksi Sinistra	Plantarfleksi Sinistra	Step Length	Stride Length	Cadance	Speed
Spearman's rho	Dorsofleksi Dextra	Correlation Coefficient	1.000	.566**	.742**	.482**	-.158	-.265	-.289*	-.318*
		Sig. (2-tailed)	.	.000	.000	.000	.273	.063	.042	.025
		N	50	50	50	50	50	50	50	50
	Plantarfleksi Dextra	Correlation Coefficient	.566**	1.000	.526**	.662**	-.142	-.104	-.313*	-.225
		Sig. (2-tailed)	.000	.	.000	.000	.324	.474	.027	.116
		N	50	50	50	50	50	50	50	50
	Dorsofleksi Sinistra	Correlation Coefficient	.742**	.526**	1.000	.516**	.160	.032	-.228	-.072
		Sig. (2-tailed)	.000	.000	.	.000	.268	.828	.111	.620
		N	50	50	50	50	50	50	50	50
	Plantarfleksi Sinistra	Correlation Coefficient	.482**	.662**	.516**	1.000	.041	.018	-.142	-.060
		Sig. (2-tailed)	.000	.000	.000	.	.779	.903	.324	.680
		N	50	50	50	50	50	50	50	50
	Step Length	Correlation Coefficient	-.158	-.142	.160	.041	1.000	.770**	.021	.566**
		Sig. (2-tailed)	.273	.324	.268	.779	.	.000	.884	.000
		N	50	50	50	50	50	50	50	50
	Stride Length	Correlation Coefficient	-.265	-.104	.032	.018	.770**	1.000	.345*	.875**
		Sig. (2-tailed)	.063	.474	.828	.903	.000	.	.014	.000
		N	50	50	50	50	50	50	50	50
	Cadance	Correlation Coefficient	-.289*	-.313*	-.228	-.142	.021	.345*	1.000	.737**
		Sig. (2-tailed)	.042	.027	.111	.324	.884	.014	.	.000
		N	50	50	50	50	50	50	50	50
	Speed	Correlation Coefficient	-.318*	-.225	-.072	-.060	.566**	.875**	.737**	1.000
		Sig. (2-tailed)	.025	.116	.620	.680	.000	.000	.000	.
		N	50	50	50	50	50	50	50	50

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Grafik hubungan antara mobilitas *metatarsophalangeal I* sisi *dextra* dengan pola berjalan



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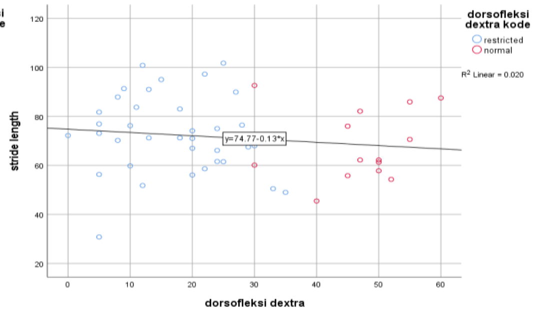

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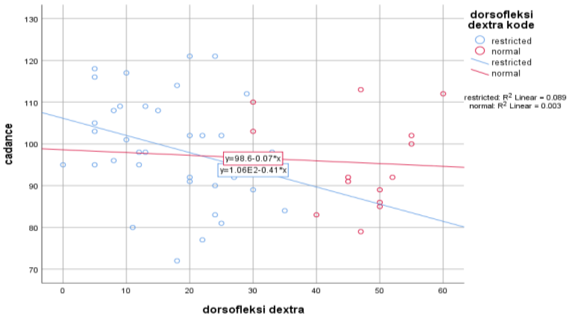

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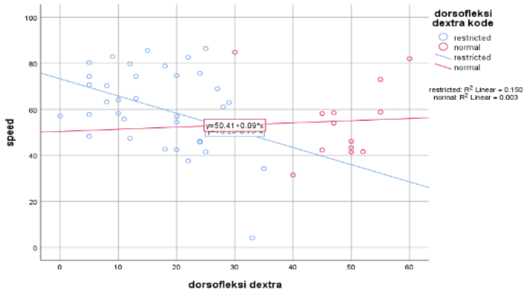

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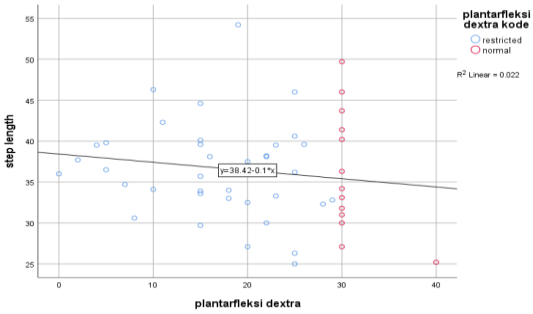

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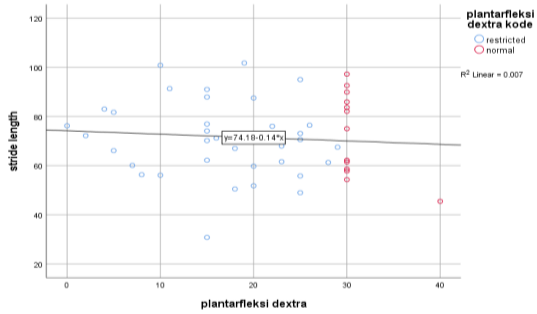

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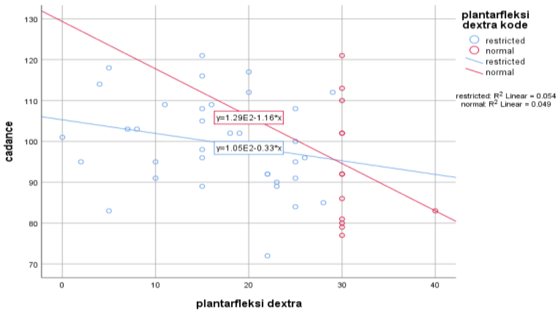

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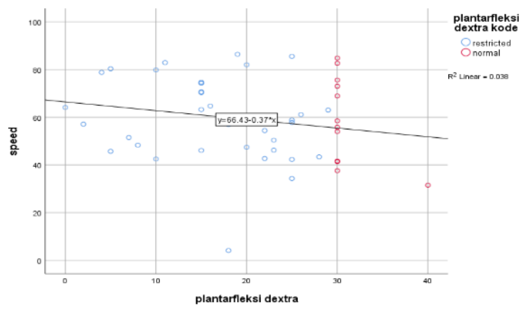

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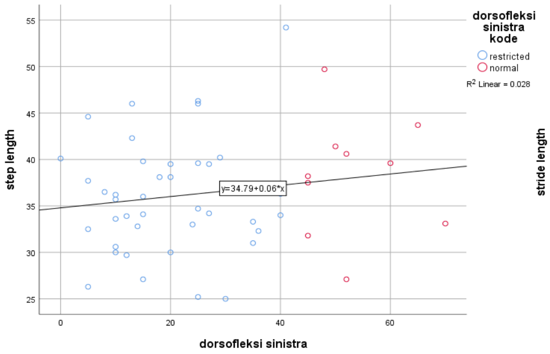
Grafik hubungan antara mobilitas *metatarsophalangeal I* sisi *sinistra* dengan pola berjalan



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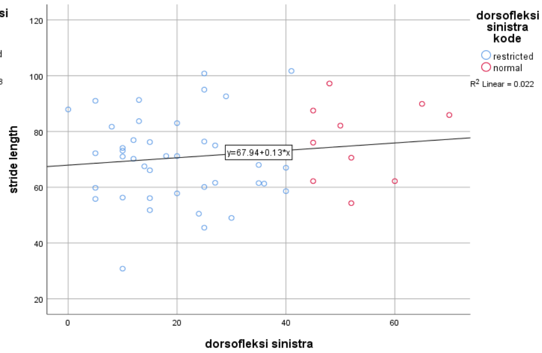

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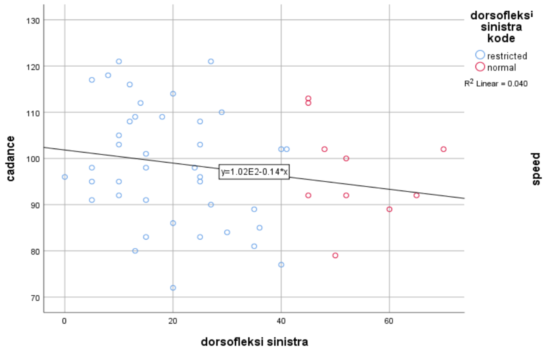

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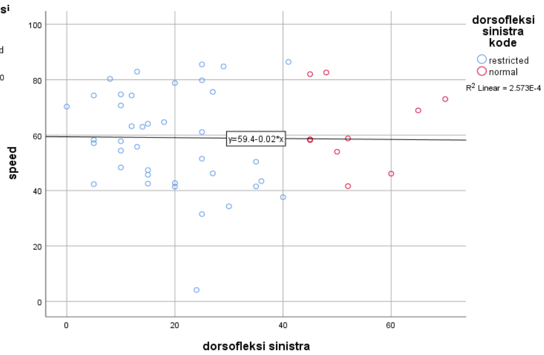

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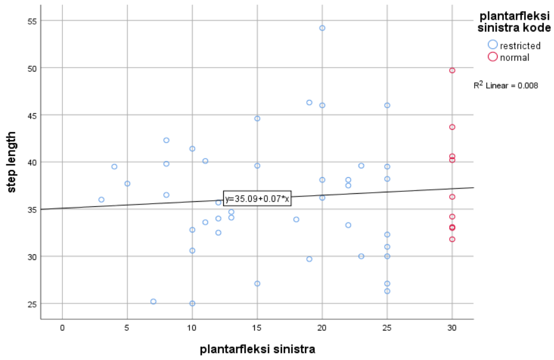

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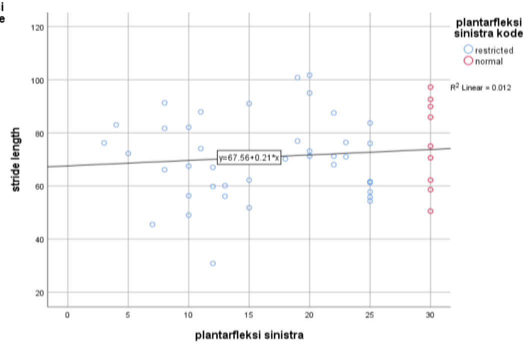

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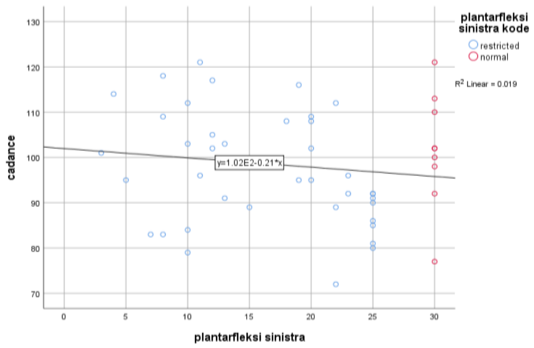

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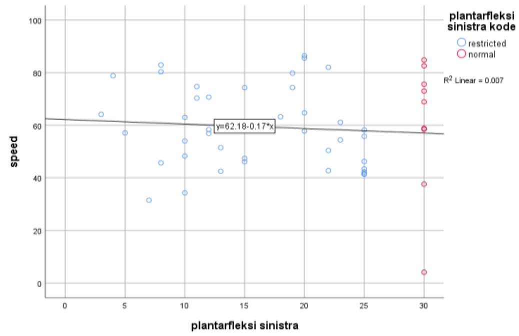
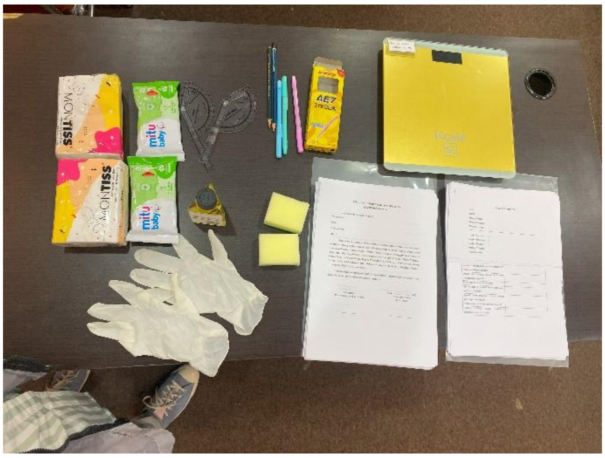


(h)

1. Alat dan Bahan



Alat dan bahan untuk pengukuran *metatarsophalangeal I,* berat badan, *step length* dan *stride length*

Alat dan bahan untuk pengukuran tinggi badan, *step length* dan *stride length*

2. Pengukuran Mobilitas *Metatarsophalangeal I, Step length, Stride length, cadance¸* dan *speed*

Pengukuran *step length* dan *stride length*

Pengukuran *metatarsophalangeal I*

Pengisian data responden

Pengukuran tinggi badan

Pengukuran *step length* dan *stride length*

Pengukuran *cadance*

3. **Pemberian Edukasi**

Pemberian edukasi kepada pegawai di DP3A-PPKB Kantor Gubernur Sulawesi Selatan

Pemberian poster edukasi kepada pihak DP3A-PPKB Kantor Gubernur Sulawesi Selatan

Pemasangan poster edukasi di papan informasi di DP3A-PPKB Kantor Gubernur Sulawesi Selatan

Lampiran 6. Informed Consent

UNTUK IKUT SERTA DALAM PENELITIAN
(INFORMED CONSENT)

Yang bertanda tangan dibawah ini:

Nama/Inisial : Fe

Umur : 47

Jenis kelamin : Perempuan

Alamat : Jl.

Dengan ini menyatakan bahwa, setelah mendapat penjelasan sepenuhnya menyadari, memahami tentang tujuan, manfaat dan risiko yang mungkin timbul dalam penelitian, serta sewaktu-waktu dapat mengundurkan diri dari keikutsertaan, maka saya ***setuju*** untuk ikut serta dalam penelitian yang berjudul: "Hubungan antara Mobilitas *Metatarsophalangeal I* dengan Pola Berjalan pada Pegawai Wanita di Kantor Gubernur Provinsi Sulawesi Selatan" yang dilakasanakan oleh Mahasiswa Program Studi S1 Fisioterapi Fakultas Keperawatan Universitas Hasanuddin.

Demikian lembar persetujuan ini dibuat dengan penuh kesadaran dan tanpa dipaksa dari pihak lain untuk dipergunakan sebagaimana mestinya.

Makassar, 09 Mei 2023

Mengetahui,
Penanggung jawab penelitian,

( )

Yang menyatakan
persetujuan,

( )

Lampiran 7. Data Responden

DATA RESPONDEN

Nama : Ay

TB/BB : 155 / 50

Usia : 27

Riwayat Penyakit : –

Riwayat Trauma : –

ROM *Metatarsophalangeal I*

1. Fleksi : D : 60° S : 45°
2. Ekstensi : D : 20° S : 22°

Step Length : 3718 → ~~0.75~~ 0,375

Stride Length : 8719 → 0,875 m

Cadance : 112

Speed : 0,820

Lampiran 8. Draft Artikel

Relationship between Metatarsophalangeal I Mobility and Walking Patterns in Female Employees at the Office of the Governor of South Sulawesi

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[1,2,3,4,5] Bachelor of Physiotherapy Program, Faculty of Nursing, Hasanuddin University

ABSTRACT

Gait disturbances markedly increase with age, from about 10% between the ages of 60 and 69 years to more than 60% in those over 80 years (Pirker and Katzenschlager, 2017). The purpose of this study was to determine the relationship between metatarsophalangeal I mobility and gait patterns. The objects of this study were 50 female employees at the Office of Women's Empowerment, Child Protection, Population Control and Family Planning (DP3APPKB) Office of the Governor of South Sulawesi in April - May 2023. For metatarsophalangeal mobility I used goniometer measurements which were interpreted in the form of range of motion (ROM), for step & stride length using footprint, for cadance measurement by calculating the number of steps in 1 minute, and for speed using the formula with units (m/s). For those who have a significant relationship, among others, right dorsiflexion with a cadance of 8.4% (p=0.042, r= -0.289); dextra plantar flexion with a cadance of 9.8% (p= 0.027, r= - 0.313); dorsiflexion dextra with a speed of 10.1% (p= 0.025, r= - 0.318). As for the distribution, the results showed that metatarsophalangeal I mobility was dominated by samples that were experiencing restricted and the distribution of gait patterns was dominated by samples that were abnormal.

Keyword *: Metatarsophalangeal I, Step & Stride length, Cadance, Speed*

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Email : wmeyzulvina@gmail.com

Introduction

Humans have several body parts, one of which is the feet. The foot is one of the locomotion tools that helps the process of moving from one place to another. Feet allow a person to move to carry out various activities without any significant obstacles, both for walking, exercising, working, driving a motorized vehicle, and various other activities (Herdiman, 2015). The foot has a complex and flexible anatomical structure that serves as the body's foundation (base of support) and adjustment to uneven surfaces (Davis, 2021). Walking is the activity of moving forward or moving from one place to another by walking (Wahyuningsih, 2021). Almost all activities of living things are done by walking. Everyone has a different way of walking. This can be seen through the running cycle. The walking cycle is the activity that occurs between one foot touching the ground and the foot on the same side touching the ground again. One walking cycle consists of two phases, namely the stance phase and the swing phase (Catherine and Suryantari, 2017).

The walking cycle has motion (spatiotemporal) characteristics such as step length, stride length, speed, and cadence (Rehman et al., 2019). Stride length is the distance between two identical footprints, while step length can be defined as the distance between two footprints from right to left or vice versa (Bubnis, 2018). Cadence is the number of steps in a certain time and speed is the distance traveled in a certain time (Ayu et al., 2019). Gait disturbances markedly increase with age, from about 10% between the ages of 60 and 69 years to more than 60% in those over 80 years (Pirker and Katzenschlager, 2017). One of the factors that affect everyone's gait is muscle fatigue (Heesen et al., 2018). Local Muscle Fatigue (LMF) can occur when there is repetitive activity thereby reducing performance, decreasing joint range of motion and can interfere with movement control (Kao et al., 2018) and decreasing the speed of leg performance so that there is a risk of falling (Halder et al., 2021). However, according to Granacher (2010) said that muscle fatigue can significantly increase gait speed and stride length.

Muscle fatigue can reduce the performance of absorbing the reaction force from the surface (shock absorption) to give the body movement forward. Reduced shock absorption can cause muscle and joint pain in the lower extremity area and the risk of falling (Lung et al., 2021). One of the structures that plays an important role in controlling shock absorption, namely metatarsophalangeal I (Abelson, 2022). Metatarsophalangeal I plays a role in maintaining stability in the mid-stance stage and controls propulsion in the toe-off phase (Abelson, 2022). When dorsoflexion occurs in metatarsophalangeal I, the windlass mechanism also works (Payne, 2013). The term windlass mechanism relates to 'the dynamic bow-stringing effect' which is formed by a number of important structures of the plantar aspect (lower part) of the foot, namely the plantar fascia, sesamoid bones, plantar pads and their various attachments below the metatarsophalangeal joints (Dunne, 2021). If mdunetatarsophalangeal I flexibility is lost, the balance and stability of the body will decrease (Lapidos, 2019). Flexibility is one of the important components of mobility. When the muscles and surrounding tissues are tense, it is difficult to move the joints and mobility decreases (Bourg, 2021).

The use of inappropriate footwear is also one of the factors that affect the flexibility of the toes. Most shoes tend to have a constricting effect on the toes. If the feet adapt continuously to that position, it will be difficult for the toes to stretch and the mobility of the toes decreases (Bold, 2017). This is in line with the opinion of Nagy (2018) which states that the narrower the use of shoes, the metatarsophalangeal I and other fingers will rub against the inside of the shoe. This friction will cause a callus to form to protect the skin. This callus is also dangerous because it will make the skin harden until it thickens which can affect the mobility of the toes.

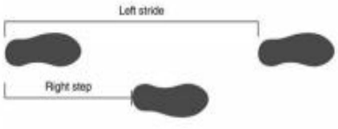
Researchers have made observations on female employees at the South Sulawesi Governor's Office. The Governor's Office is a government agency consisting of several elements that handle a number of matters, one of which is the object of research being the Division of Women's

Empowerment, Child Protection, Population Control, and Family Planning. Employee working time at the Governor's Office of South Sulawesi Province is eight hours per day. Based on the observations of researchers, employees are more often in a sitting working position. All female employees wear flat shoes and various sizes. The results of the researchers' observations of employees found that 15 employees experienced limited ROM in metatarsophalangeal I with indications of gait abnormalities due to a decrease in step length, stride length, and speed (Primary data, 2023).

Methods

The procedure of this research is a correlational research with a cross-sectional design. The objects of this study were 50 female employees at the Office of Women's Empowerment, Child Protection, Population Control and Family Planning (DP3APPKB) Office of the Governor of South Sulawesi in April - May 2023. The independent variable in this study was metatarsophalangeal mobility I. Meanwhile, the dependent variable on this research is a walking pattern. The inclusion criteria in this study were female employees aged 20-59 years. The exclusion criteria in this study were having a postoperative history of the lower extremity area based on interviews.

Measuring the mobility of the first metatarsophalangeal, namely measuring the range of motion in the first metatarsophalangeal using a goniometer. Samples were directed to dorsiflexion and plantarflex metatarsophalangeal I for both sides of the leg. The sample is directed in a sitting position. For the goniometer fulcrum point, it is placed on the dorsal metatarsophalangeal I joint, the stationary arm is placed on the dorsal metatarsal I, and the movement arm is on the dorsal proximal phalanges. For the step & stride length tool, use a white footprint and a flat bottom. The sample is directed to a standing position, then both legs are given acrylic oil to form a foot pattern and direct the sample to walk on a white flat mat.



For cadance tools use a stopwatch. The sample is in a standing position and is directed to walk as comfortably as possible with a straight forward gaze for 1 minute then measures the number of sample steps. Speed will be assessed by the result of the stride length measurement multiplied by the result of the cadence measurement for each subject. Speed results in meters per second (m/s).

Speed (m/s) = stride length (m) x cadence (step/min) / 120

Result

1. Characteristics of the Research Sample

Table 1.1 shows the characteristics of the research sample based on age, height and weight. The data on the characteristics of the research sample can be seen in the following table.

Table 1.1 Distribution of Research Characteristics

Characteristics	**Total n (%)**
Age (year)	
22-29	23 (46%)
30-37	7 (14%)
38-45	5 (10%)
46-53	6 (12%)
54-61	9 (18%)
Total	50 (100%)
Height (cm)	
142-149	10 (20%)
150-157	27 (54%)
158-165	12 (24%)
166-173	1 (2%)
Total	50 (100%)
Weight (kg)	
40-47	6 (12%)
48-55	15 (30%)
56-63	17 (34%)
64-71	9 (18%)
72-79	3 (6%)
Total	50 (100%)

source: Primary data, 2023. (Note: n = Frequency, % = Percent, cm = Centimeters, kg = Kilograms)

The proportion of the sample with the age of 22-37 years is more dominant than the age of 38-57 years, as many as 30 people (60%). The number of samples with a height of 150-157 cm has the highest number compared to the height of 142-149 cm and 158-165 cm with 27 people (54%). The number of samples with a body weight of 56-75 kg has the highest number compared to a body weight of 40-55 kg as many as 29 people (58%).

2. Distribution of Metatarsophalangeal I Mobility to Female Employees at the Office of the Governor of South Sulawesi

Metatarsophalangeal mobility I in this study sample was measured using a goniometer, then interpreted based on the normal level of ROM (Range of Motion). The results of metatarsophalangeal I mobility in 50 samples are presented in Table 1.2

Table 1.2 Distribution of metatarsophalangeal I mobility

Variable		**Total n (%)**
Metatarsophalangeal I dextra		
Dorsofleksi	Normal	14 (28%)
	Restricted	36 (72%)
Total		50 (100%)
Plantarfleksi	Normal	13 (26%)
	Restricted	37 (74%)
Total		50 (100%)
Metatarsophalangeal I Sinistra		
Dorsofleksi	Normal	10 (20%)
	Restricted	40 (80%)
Total		50 (100%)
Plantarfleksi	Normal	9 (18%)
	Restricted	41 (82%)
Total		50 (100%)

source: Primary data, 2023. (Note: n= frequency, %= percent)

Table 1.2 shows the distribution of metatarsophalangeal I mobility in female employees at the DP3A-PPKB Office of the Governor of South Sulawesi. The proportion of metatarsophageal mobility I was dominated by restricted with an average value of 16.9% for the dextra dorsiflexion side, 16.7% for the dextra plantarflexion side, 19.2% for the left dorsiflexion side, and 16.1% for the left plantarflexion side.

3. Distribution of Walking Patterns to Female Employees in the Office of the Governor of South Sulawesi

The gait pattern is the activity that occurs between one foot touching the ground and the foot on the same side touching the ground again. The spatiotemporal characteristics of gait consist of step length, stride length, cadance, and speed. The results of the walking patterns of the 50 samples are presented in Table 1.3

Table 1.3 Distribution of walking patterns

Variable		**Total**
		n (%)
Step Length	Normal	0 (0%)
	Abnormal	50 (100%)
Stride Length	Normal	0 (0%)
	Abnormal	50 (100%)
Cadance	Normal	24 (48%)
	Abnormal	26 (52%)
Speed	Normal	0 (0%)
	Abnormal	50 (100%)

source: Primary data, 2023. (Note: n= frequency, %= percent)

Based on Table 1.3, the results of the analysis of gait data were dominated by the abnormal category of 50 people (100%) for step length, stride length, and speed. Meanwhile, for cadance, there were 24 people (48%) in the normal category and 26 people (52%) in the abnormal category.

4. Relationship between Metatarsophalangeal I Mobility and Walking Patterns in Female Employees at the South Sulawesi Governor's Office

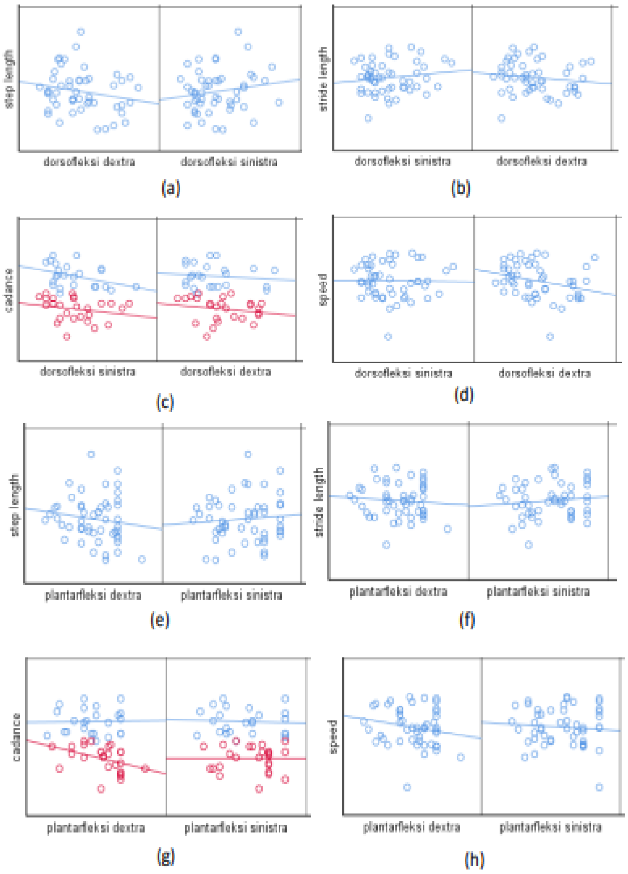
The relationship between the dependent variable and Metatarsophalangeal I mobility is presented in the following table.

Table 1.4 The relationship of the dependent variable with metatarsophalangeal I mobility

Variabel		p	r	r^2
Step length	Dorsofleksi *Dextra*	0,273	- 0,158	0,025
	Plantarfleksi *Dextra*	0,324	- 0,142	0,020
	Dorsofleksi *Sinistra*	0,268	0,160	0,025
	Plantarfleksi *Sinistra*	0,779	0,041	0,002
Stride length	Dorsofleksi *Dextra*	0,063	- 0,265	0,070
	Plantarfleksi *Dextra*	0,474	- 0,104	0,011
	Dorsofleksi *Sinistra*	0,828	0,032	0,001
	Plantarfleksi *Sinistra*	0,903	0,018	0,001
Cadance	Dorsofleksi *Dextra*	0,042*	- 0,289*	0,084
	Plantarfleksi *Dextra*	0,027*	- 0,313*	0,098
	Dorsofleksi *Sinistra*	0,111	- 0,228	0,052
	Plantarfleksi *Sinistra*	0,324	- 0,142	0,020
Speed	Dorsofleksi *Dextra*	0,025*	- 0,318*	0,101
	Plantarfleksi *Dextra*	0,116	- 0,225	0,051
	Dorsofleksi *Sinistra*	0,620	- 0,072	0,005
	Plantarfleksi *Sinistra*	0,680	- 0,060	0,004

Source: Primary Data, 2023. (Note: p = probability of Spearman test results for step, stride, cadance and speed, * = sign indicating a significant difference ($p < 0.05$).

Table 5.14 shows that there is no significant relationship between metatarsophalangeal I mobility and gait pattern, consisting of dorsiflexion and plantarflexion of the dextra side to stride length, dorsiflexion and plantarflexion of the left side to step length, dorsiflexion and plantarflexion of the dextra side to stride length, dorsiflexion and left plantar flexion to stride length, dorsiflexion and left plantar flexion to cadance, dextra plantar flexion to speed, dorsiflexion and left plantar flexion to speed . However, there are some that have a significant relationship, including right dorsiflexion with a cadance of 8.4% (p = 0.042, r = -0.289) ; dextra plantar flexion with a cadance of 9.8% (p = 0.027, r = -0.313); dorsiflexion right with a speed of 10.1% (p = 0.025, r = -0.318).



Note :

1. for step length, stride length, dan speed

    ○ abnormal
    — abnormal

2. for cadance

    ○ normal
    ○ abnormal
    — normal
    — abnormal

Figure 1.1 Graph of the relationship between metatarsophalangeal I mobility and gait patterns

Based on the graph in Figure 1.1 it appears that there is a slope of the graph line which indicates a reciprocal relationship consisting of dorsiflexion and plantarflexion for the dextra side to step length, dorsiflexion and plantarflexion dextra to stride length, dorsiflexion and plantarflexion dextra to cadance, dorsiflexion and plantarflexion left to cadance, dorsiflexion and right plantarflexion for speed, dorsiflexion and left plantarflexion for speed. However, some also have a linear relationship, namely in left dorsiflexion to step length, left dorsiflexion to stride length, left plantarflexion to step length, left plantarflexion to stride length. So, the results of this study indicate that graphs that have a linear slope are in line with the theory that the more limitations of metatarsophalangeal I mobility, the lower the gait pattern. However, based on Figure 1.1 it shows that many graphs have a reciprocal slope.

Discussion

Based on the results of this study, it was found that there was no dominant relationship between the first metatarsophalangeal mobility and gait patterns. The step length and stride length did not have a significant relationship with the first metatarsophalangeal mobility (dextra dorsiflexion, dextra plantarflexion, left dorsiflexion, and left plantarflexion). Meanwhile, cadance had a significant relationship to dextra dorsiflexion ($p = 0.042$, $r = -0.289$) and dextra plantarflexion ($p = 0.027$, $r = -0.313$) and did not have a significant relationship to left dorsiflexion and left plantarflexion. Speed had a significant relationship only to dextra dorsiflexion ($p = 0.025$, $r = -0.318$) and did not have a significant relationship to dextra plantarflexion, left dorsiflexion, and left plantarflexion. In line with research (Laroche et al., 2006) which showed that there was a significant relationship between speed and metatarsophalangeal dorsiflexion. However, it is not in line with this study for stride length because in research (Laroche et al., 2006) there is a significant relationship between stride length and metatarsophalangeal mobility.

According to research (Williams et al., 2022) explains that if the energy generated from the windlass mechanism is high, the proportion of walking patterns also increases. However, the energy generated from the windlass mechanism also depends on the performance of the foot structure, especially metatarsophalangeal I. In line with research (Kondo, Iwamoto and Kito, 2021) which explains that there is a significant relationship between the windlass mechanism and the ground reaction force (GRF) and the ankle power, in the study also explained that strong coordination is needed between the arcus and metatarsophalangeal I in the windlass process in order to produce maximum propulsion. If metatarsophalangeal I is restricted and has mobility, there is a possibility that the performance of the windlass mechanism cannot be maximized which results in a change in gait pattern.

In walking, there are several muscles that work when you start taking steps. When the hip and knee are in a flexed position to produce a swing motion, the working muscle is the iliopsoas muscle and an eccentric contraction occurs by the biceps femoris, semimembranosus, semitendinosus. Meanwhile, the hip extensor muscles (gluteus maximus and hamstring muscles) work to stabilize the hip during the absorption phase (shock absorption) and to control the forward momentum of the body when the weight shifts forward. The adductor hip muscles work to control the balance in the legs which bear the weight while walking. For the ankle area, when the ankle wants to change its position from dorsiflexion to plantaflexion, eccentric contractions occur by the tibialis anterior, extensor digitorum longus, extensor hallucis longus, and third fibularis muscles. When the ankle is maximally in a plantarflexion position, the gastrocnemius and soleus muscles work to produce thrust during the heel off – toe off stage (Grujicic, 2022).

Figure 1.2 Stance Phase
(source : https://musculoskeletalkey.com/fundamentals-of-human-gait/)

For the windlass mechanism, it has a role from the midstance phase to the toe-off. The midstance stage is the stage when the body is supported by one leg. The hip and knee are in extension position, then the ankle begins to dorsiflex 5° which is driven by the triceps surae muscle and the windlass mechanism begins to work for energy absorption (shock absorption). Next, the heel-off stage, at this stage all body weight shifts toward the front and is controlled by metatarsophalangeal I. When the knee is flexed, the center of gravity is on the other leg when it starts to hit (heel-off phase). During this phase, the ankle also changes position from dorsiflexion to plantarflexion, while the hip hyperextends 10°-13°. In the toe off stage, the first metatarsophalangeal undergoes dorsiflexion to control stability and produce thrust. When the pushing force is working, the feet are starting to not touch the ground, the knee position becomes flexed 35°-40°, the ankles experience plantar flexion 15°-20° until the legs experience a swing phase (Mulyawati and Arifin, 2017).

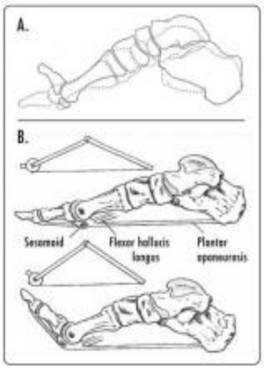


Figure 1.3 Windlass mechanism
(sumber : ACE Physical Therapy & Sport Medicine Institute)

For the ankle and metatarsophalangeal areas, the step length, stride length, cadance and speed are affected by the windlass mechanism. As the foot transitions from mid-stance to toe off, the metatarsophalangeals shift from a plantarflexed position to a dorsiflexed position. Metatarsophalangeal dorsiflexion produces a windlass mechanism by utilizing the plantar fascia. The plantar fascia around the first metatarsophalangeal pulls the calcaneus toward the toes. When energy is generated in the midtarsal joint, a shock absorption phase occurs in the first metatarsophalangeal joint which indicates a combination of kinematic and kinetic forces between the two joints, so that the medial arch is lifted off the ground and changes position from a pronated position to a supinated position, and the metatarsophalangeal I issued a thrust (Williams et al., 2022). If there is damage to the plantar fascia area, foot anatomy or metatarsophalangeal mobility, it is possible that the performance of the windlass mechanism is not optimal and requires excess energy to walk due to lack of thrust (ACE Physical Therapy and Sport, 2018)

However, the restricted occurrence of metatarsophalangeal I does not really affect changes in gait patterns due to several other factors that can be abnormal gait patterns from internal factors such as biomechanics, body weight, abnormal inferior anatomy and external factors such as road terrain, use of footwear or trauma.

CONCLUSIONS AND SUGGESTIONS

The distribution of metatarsophalangeal I mobility in female employees is dominated by the restricted category. The distribution of gait patterns for female employees for step length, stride length, and speed is dominated by the abnormal category. Meanwhile, for cadance, more than half of the respondents experienced abnormal. There is no significant relationship with a very weak correlation between metatarsophalangeal I mobility and gait patterns in female employees at the P3A-PPKB Office of the Governor of South Sulawesi Province. As for the samples that were restricted for metatarsophalangeal I mobility, they often did exercises such as stretching, strengthening, and mobility set up, or according to the posters that had been given. For future researchers, it is necessary to carry out further research with more appropriate instruments considering that there is still a lack of data and research on this issue, especially in Indonesia. In addition, future researchers pay more attention to other factors that can affect metatarsophalangeal I mobility and gait patterns but are not considered as sample criteria.

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