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LAMPIRAN

Lampiran 1.1 Surat Izin Penelitian Dinas PTSP Kota Makassar

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 : **17379/S.01/PTSP/2023**
Lampiran : -
Perihal : **Izin penelitian**

Kepada Yth.
1. Walikota Makassar
2. Rektor Universitas Hasanuddin Makassar

di-
Tempat

Berdasarkan surat Dekan Fak. Keperawatan UNHAS Makassar Nomor : 1551/UN4.18.1/PT.01.04/2023 tanggal 15 Mei 2023 perihal tersebut diatas, mahasiswa/peneliti dibawah ini:

N a m a	:	**FEBRIANTO**
Nomor Pokok	:	R021191056
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 TINGKAT AKTIVITAS FISIK DAN KEBUGARAN KARDIORESPIRASI DENGAN REACTION TIME PADA ATLET MOBILE E-SPORTS DI KOTA MAKASSAR "

Yang akan dilaksanakan dari : Tgl. ***23 mei s/d 23 Juni 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 23 Mei 2023

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

Drs. MUH SALEH, M.Si.
Pangkat : PEMBINA UTAMA MUDA
Nip : 19690717 199112 1002

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

Lampiran 1.2. Surat Rekomendasi Persetujuan Etik Penelitian

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 : 3956/UN4.14.1/TP.01.02/2023

Tanggal : 09 Juni 2023

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

No.Protokol	30523091144	No. Sponsor Protokol	
Peneliti Utama	**Febrianto**	Sponsor	Pribadi
Judul Peneliti	**Hubungan Antara Tingkat Aktivitas Fisik dan Kebugaran Kardiorespirasi dengan Reaction Time pada Atlet Mobile E-Sports di Kota Makassar**		
No.Versi Protokol	1	Tanggal Versi	30 Mei 2023
No.Versi PSP	1	Tanggal Versi	30 Mei 2023
Tempat Penelitian	**Kota Makassar**		
Judul Review	[x] Exempted [ ] Expedited [ ] Fullboard	Masa Berlaku **09 Juni 2023 Sampai 29 Mei 2024**	Frekuensi review lanjutan
Ketua Komisi Etik Penelitian	Nama : Prof.dr.Veni Hadju,M.Sc,Ph.D	Tanda tangan	Tanggal 09 Juni 2023
Sekretaris komisi Etik Penelitian	Nama : Dr. Wahiduddin, SKM.,M.Kes	Tanda tangan	Tanggal 09 Juni 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 1.3 Surat Keterangan Telah Menyelesaikan Penelitian

UNIT KEGIATAN MAHASISWA (UKM)
UNHAS ESPORTS UNIVERSITAS HASANUDDIN
Sekretariat: Villa Butta Karaeang, Blok D3, No. 15 (92112)
Telp: 085156237390 Email:unhasesport@gmail.com

Makassar, 8 Mei 2023

SURAT KETERANGAN PENELITIAN / STUDI

Yang bertanda tangan dibawah ini Ketua Umum Unit Kegiatan Mahasiswa Unhas *Esports* Universitas Hasanuddin, menerangkan bahwa :

Nama	: Febrianto
NIM	: R021191056
Program Studi	: S1 Fisioterapi
Fakultas	: Keperawatan
Pekerjaan	: Mahasiswa Universitas Hasanuddin, Makassar

Dengan ini menyatakan yang sesungguhnya bahwa nama mahasiswa tersebut di atas **BENAR** telah melaksanakan penelitian di Universitas Hasanuddin Makassar (UNHAS *E-Sports*) dengan judul penelitian **"Hubungan Antara Tingkat Aktivitas Fisik dan Kebugaran Kardiorespirasi dengan *Reaction Time* pada Atlet *Mobile E-sports* di Kota Makassar."**

Demikian surat keterangan ini kami buat untuk dipergunakan oleh yang bersangkutan sebagaimana mestinya.

Ketua Umum Unit Kegiatan Mahasiswa
Unhas *Esports* 2023/2024

Risman
NIM. F041201054

Lampiran 1.4 *Informed Consent*

LEMBAR PERNYATAAN PERSETUJUAN
UNTUK IKUT SERTA DALAM PENELITIAN
(INFORMED CONSENT)

Yang bertanda tangan dibawah ini:

Nama/Inisial : R[redacted]

Umur : 21 tahun

Jenis Kelamin : Laki. Laki

Alamat : Jalan Damai

No. HP : 0[redacted]

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 TINGKAT AKTIVITAS FISIK DAN KEBUGARAN KARDIORESPIRASI DENGAN *REACTION TIME* PADA ATLET *MOBILE E-SPORTS* DI KOTA MAKASSAR" yang dilaksanakan 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, 7 April 2023

Mengetahui,
Penanggung jawab penelitian,

(Febrianto)

Yang menyatakan
persetujuan,

(R[redacted])

Lampiran 1.5 Data Diri Responden

DATA DIRI RESPONDEN

Nama : M[redacted] U[redacted] A[redacted] N[redacted]

Jenis Kelamin : Laki-laki/~~Perempuan~~. **coret yang tidak perlu*

Usia : 21

Pekerjaan : Mahasiswa

Klub/Tim : UNHAS E-SPORTS

Nomor Anggota :

Game yang Dimainkan : MLBB

Tangan yang Dominan : Kanan/~~Kiri~~. **coret yang tidak perlu*

Frekuensi Latihan : ...7.. hari dalam seminggu.

...8.. jam dalam sehari.

Cedera yang sedang dialami (bila ada) : _____.

Makassar, 7 April 2023

Saya yang bersangkutan,

(_____)

Lampiran 1.6 Bukti Pengisian Kuesioner

International Physical Activity Questionnaire (IPAQ)

Petunjuk Pengisian:

Pertanyaan-pertanyaan di bawah ini mengenai waktu yang Anda habiskan untuk aktif secara fisik baik di rumah, tempat kerja, pergi dari satu tempat ke tempat lain, dan saat waktu luang yang digunakan untuk rekreasi, ataupun berolahraga dalam 7 hari terakhir. Berilah tanda centang (√) pada kolom yang sesuai and isilah jawaban isian sesuai dengan keadaan anda yang sebenarnya. Isilah sesuai dengan keadaan Anda yang sesungguhnya, walaupun Anda tidak menganggap diri Anda sebagai orang yang aktif. Semua pertanyaan dijawab sesuai urutan di kuesioner.

Ingat kembali semua **aktivitas fisik berat** yang telah Anda lakukan selama **7 hari terakhir**. Aktivitas fisik berat adalah aktivitas yang memerlukan kerja keras dan menyebabkan Anda bernapas jauh lebih cepat daripada biasanya. Pikirkan aktivitas fisik yang telah Anda lakukan selama sekurang-kurangnya 10 menit pada suatu waktu

1. Selama **7 hari terakhir**, berapa hari Anda melakukan **aktivitas fisik yang berat** seperti mengangkat barang berat (≥10kg), menggali/mencangkul, senam, atau bersepeda cepat?

   _____ **hari per minggu** ☑ Tidak ada aktivitas fisik yang berat,

   **** Jika menjawab 0 atau tidak tahu/ada, Lompat ke pertanyaan nomor 3***

2. Berapa banyak waktu yang biasanya Anda habiskan untuk melakukan **aktivitas fisik yang berat** dalam sehari?

   _____**jam/hari**____**menit/hari** ☑ Tidak tahu / tidak yakin?

Pikirkan semua aktivitas sedang yang anda lakukan dalam **7 hari terakhir. Aktivitas sedang** mengacu pada aktivitas yang membutuhan upaya fisik sedang dan membuat anda bernapas lebih keras dari biasanya. Pikirkan hanya tentang aktivitas fisik yang anda lakukan setidaknya 10 menit setiap kalinya.

3. Selama 7 **hari terakhir**, berapa hari Anda melakukan **aktivitas fisik sedang** seperti membawa beban ringan (<10kg), menyapu, bersepeda santai? Ini tidak termasuk berjalan kaki

__4__ **hari per minggu** ☐ Tidak ada aktivitas fisik yang sedang

**** Jika menjawab 0 atau tidak tahu/ada, Lompat ke pertanyaan nomor 5***

4. Berapa banyak waktu yang biasanya Anda habiskan untuk melakukan **aktivitas fisik yang sedang** dalam sehari?

__3__ **jam/hari** ____ **menit/hari** ☐ Tidak tahu / tidak yakin?

Pikirkan tentang waktu yang Anda habiskan untuk **berjalan** dalam **7 hari terakhir**. Ini termasuk di tempat kerja dan di rumah, berjalan kaki untuk bepergian dari satu tempat ke tempat lain, dan setiap jalan kaki lain yang telah Anda lakukan semata-mata untuk rekreasi atau berolahraga.

5. Selama 7 **hari terakhir**, berapa hari Anda **berjalan kaki** setidaknya selama minimal 10 menit?

__7__ **hari per minggu** ☐ Tidak ada aktivitas fisik yang ringan,

**** Jika menjawab 0 atau tidak tahu/ada, Lompat ke pertanyaan nomor 7***

6. Berapa banyak waktu yang biasanya Anda habiskan untuk **berjalan** kaki selama satu hari?

__10__ **jam/hari** __30__ **menit/hari** ☐ Tidak tahu / tidak yakin?

Pertanyaan terakhir adalah tentang waktu yang Anda habiskan untuk **duduk** di hari kerja selama **7 hari terakhir**. Termasuk waktu yang dihabiskan di tempat kerja, di rumah, saat melakukan kursus dan selama waktu luang. Ini mungkin termasuk waktu yang dihabiskan untuk duduk di meja, mengunjungi teman, membaca, atau duduk atau berbaring untuk menonton televisi.

7. Selama 7 **hari terakhir**, berapa banyak waktu yang Anda habiskan untuk **duduk** pada saat hari kerja?

__12__ **jam/hari** ____ **menit/hari** ☐ Tidak tahu / tidak yakin?

Lampiran 1.7 Alat Ukur *Reaction time*

Lampiran 1.8 Alat Ukur *VO_2max* (Bangku Harvard)

Lampiran 1.9 Hasil Uji Statistik *SPSS*

Umur

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18	1	2.0	2.0	2.0
	19	7	14.3	14.3	16.3
	20	15	30.6	30.6	46.9
	21	17	34.7	34.7	81.6
	22	3	6.1	6.1	87.8
	23	4	8.2	8.2	95.9
	24	2	4.1	4.1	100.0
	Total	49	100.0	100.0	

Genre E-sports

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Battle Royal	15	30.6	30.6	30.6
	MOBA	34	69.4	69.4	100.0
	Total	49	100.0	100.0	

Tingkat Aktivitas Fisik

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rendah	15	30.6	30.6	30.6
	Sedang	34	69.4	69.4	100.0
	Total	49	100.0	100.0	

Umur * Tingkat Aktivitas Fisik Crosstabulation

		Tingkat Aktivitas Fisik		
		Rendah	Sedang	Total
Umur	18	1	0	1
	19	2	5	7
	20	4	11	15
	21	5	12	17
	22	0	3	3
	23	3	1	4
	24	0	2	2
Total		15	34	49

Tingkat Kebugaran Kardiorespirasi

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Kurang	6	12.2	12.2	12.2
	Cukup	20	40.8	40.8	53.1
	Baik	15	30.6	30.6	83.7
	Baik sekali	8	16.3	16.3	100.0
	Total	49	100.0	100.0	

Umur * Tingkat Kebugaran Kardiorespirasi Crosstabulation

Count

		Tingkat Kebugaran Kardiorespirasi				
		Kurang	Cukup	Baik	Baik sekali	Total
Umur	18	0	0	1	0	1
	19	1	3	1	2	7
	20	1	5	6	3	15
	21	3	7	5	2	17
	22	0	2	0	1	3
	23	1	2	1	0	4
	24	0	1	1	0	2
Total		6	20	15	8	49

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Visual Reaction Time	49	193	301	237.16	23.176
Auditory Reaction Time	49	537	738	619.04	48.537
Ruler Drop Reaction Time	49	153	208	175.53	12.069
Valid N (listwise)	49				

Correlations

			Tingkat Aktivitas Fisik
Spearman's rho	Tingkat Aktivitas Fisik	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	49
	Visual Reaction Time	Correlation Coefficient	-.049
		Sig. (2-tailed)	.740
		N	49
	Auditory Reaction Time	Correlation Coefficient	-.141
		Sig. (2-tailed)	.334
		N	49

	Ruler Drop Reaction Time	Correlation Coefficient	-.074
		Sig. (2-tailed)	.615
		N	49

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

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

Correlations

			Tingkat Kebugaran Kardiorespirasi
Spearman's rho	Tingkat Kebugaran Kardiorespirasi	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	49
	Visual Reaction Time	Correlation Coefficient	-.551**
		Sig. (2-tailed)	.000
		N	49
	Auditory Reaction Time	Correlation Coefficient	-.353*
		Sig. (2-tailed)	.013
		N	49
	Ruler Drop Reaction Time	Correlation Coefficient	-.548**
		Sig. (2-tailed)	.000
		N	49

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

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

Lampiran 1.10 Dokumentasi Proses Penelitian

Proses pengukuran *reaction time.*

Proses pengukuran kebugaran kardiorespirasi (*VO_2max*).

Proses pengisian kuesioner aktivitas fisik.

Lampiran 1.11 Riwayat Hidup Peneliti

BIODATA

Nama : Febrianto
NIM : R021191056
Angkatan : 2019
Tempat tanggal lahir : Sassa, 25 Februari 2001
Jenis kelamin : Laki-laki
Agama : Islam
Alamat : Jalan Poros Sassa, Desa Sassa, Kec. Baebunta, Kab. Luwu Utara
No. Telp : 085342608172
Email : febriantoyzf@gmail.com
Hobi : Olahraga
Motto : Bersyukur dan mengambil pelajaran

Riwayat pendidikan :

- SD Negeri 029 Sassa (2007 – 2013)
- SMP Negeri 4 Masamba (2013 – 2016)
- SMA Negeri 8 Luwu Utara (2016 – 2019)
- S1 Fisioterapi Fakultas Keperawatan Universitas Hasanuddin (2019 – sekarang)

Riwayat organisasi :

- Pengurus Harian Himpunan Mahasiswa Fisioterapi F.Kep-UH
- Pengurus Harian Himpunan Mahasiswa Islam (HMI) Komisariat Kedokteran Universitas Hasanuddin
- Pengurus TBF Sternum Himafisio F.Kep-UH
- Ketua Majelis Permusyawaratan Mahasiswa Kema F.Kep-UH

Riwayat pelatihan:

- Latihan Kepemimpinan 1 HIMAFISIO F.Kep-UH tahun 2019
- *Basic Training* HMI komisariat Kedokteran Universitas Hasanuddin tahun 2020
- Latihan Kepemimpinan Tingkat Menengah (LKTM) FIKP UNHAS tahun 2021

Lampiran 1.12 *Draft* Artikel Penelitian

Relationship Between Physical Activity and Cardiorespiratory Fitness on Reaction Time in Mobile E-sports Athletes in Makassar

Febrianto, Irianto, Immanuel Maulang

Physiotherapy Study Program, Faculty of Nursing, Hasanuddin University
Tamalanrea Indah, Makassar, South Sulawesi 90245, Indonesia

Corresponding Author:
Name: Febrianto
Email: febriantoyzf@gmail.com

Introduction: *While the e-sports industry has grown rapidly in recent years, there is still little knowledge about the performance factors of e-sports players. The purpose of this study was to examine the relationship between physical fitness and reaction time in e-sports athletes.* ***Methods:*** *This study is a descriptive analytic research using a cross sectional design and purposive sampling. This study included 49 mobile e-sports athletes who reported gaming at least twenty hours per week. Data of physical activity level, cardiorepiratory fitness level, and reaction time were collected. Spearman correlations were used to determine the relationship.* ***Results:*** *Level of physical activity showed that of the three types of reaction time, all significant correlation values >0.05. Meanwhile, for the variable level of cardiorespiratory fitness to reaction time, all three showed a significant correlation value <0.05.* ***Conclusions:*** *There is no relationship between the level of physical activity and reaction time in mobile e-sports athletes. Meanwhile, there is a relationship between the level of cardiorespiratory fitness and reaction time.*

Keywords: *Reaction Time, E-sports, Physical Fitness, Physical Activity*

1. INTRODUCTION

Video games have developed from being just a hobby into a form of competitive sport known as e-sports (Wattanapisit et al., 2020). The popularity of digital game competitions has attracted the attention of many people around the world and has been widely watched. E-sports has even been accepted as one of the official sports for the 2022 Asian Games and the 2024 Paris Olympics (Wattanapisit et al., 2020).

During training, e-sports athletes develop extra hand-eye coordination, fast reaction time, and decision-making agility (Lam et al., 2022). On hands and fingers e-sports place significant demands (Tholl et al., 2022). Playing video games requires fast and repetitive hand and finger movements (Zwibel et al., 2019). Special skills such as hand-eye coordination, muscle memory, and fast reaction time increase the chances of achieving success in these fast-paced, skill-requiring video games (Stewart et al., 2020). Reaction time plays an important role for e-sports players (Pallavicini et al., 2018). E-sports players have determined that reaction time training is quite important, because fast reaction time is a constituent for success in most competitive games as it is important for quick decision making (Ersin et al., 2022; Nagorsky and Wiemeyer, 2020).

Several studies have shown that fitter people are associated with faster reaction times. Previous studies have also shown that physical activity and exercise as well as improving physical fitness and cardiorespiratory fitness can support the development of cognitive function. Therefore, it can be assumed that physical exercise and the development of physical conditions can have an impact on reaction time, directly through training in the capacity to respond to stimuli and indirectly through its impact on cognitive (Reigal et al., 2019).

Several studies have investigated the physical fitness profile of e-sports players specifically (Kari et al., 2018) and they suggest that incorporating physical activity into training programs has the potential to have a positive effect on e-sports performance. However, this relationship remains to be explored. The relationship between health-related components of physical fitness and reaction time in e-sports players is not well understood (Dykstra et al., 2021).

While the e-sports industry has grown rapidly in recent years, there is still little knowledge about the performance factors of e-sports players, the performance parameters of players or how to improve them (Pedraza-Ramirez et al., 2020). E-sports is still trying to find reliable systems that help players and coaches improve their performance. Training for other professional sports has been largely based on more advanced research and disciplines, while e-sports training still lacks much empirical evidence (Nagorsky and Wiemeyer, 2020).

2. METHODS

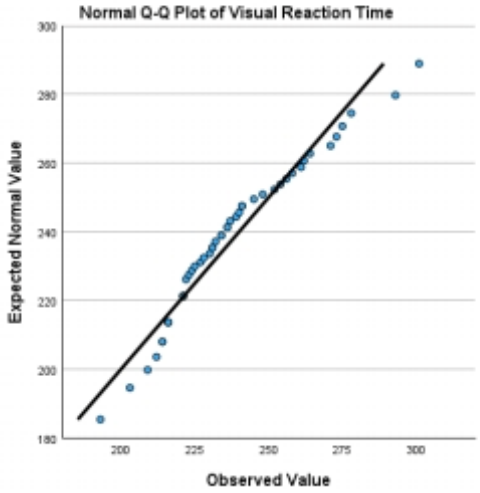
This study is a descriptive analytic research using a cross sectional design and purposive sampling. This study included 49 mobile e-sports athletes who reported gaming at least twenty hours per week. Subjects were recruited from the e-sports club in Makassar. The subject are between 18 – 24 years old and all respondents are male and the dominant hand is the right hand. Data of physical activity level, cardiorepiratory fitness level, and reaction time were collected. Physical activity level was investigated using the IPAQ -short form questionnaire, while cardiorespiratory fitness level in the form of VO2max values was measured using the Harvard Step Test.

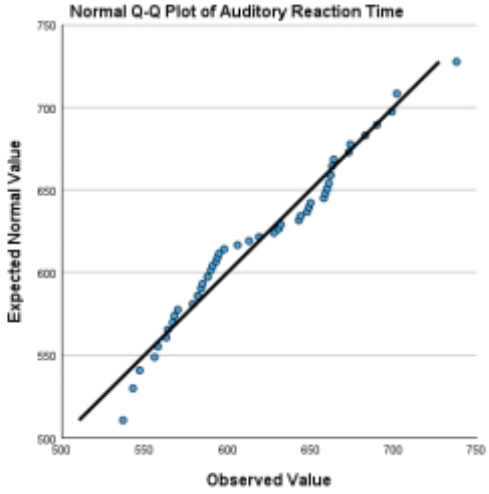
Reaction time testing consisted of visual and auditory reaction time test using the online reaction time test in mobile smartphone application, and the ruler drop test. In the visual and auditory reaction time test, the participant looked at smartphone screen and clicked at the screen as fast as they could when the screen switched from red to green for visual testing, and when they hear a sound from the smartphone for auditory testing. Reaction time was recorded in milliseconds. In the ruler drop test, the participant placed his dominant arm in an open "c" position; the meter stick was held at the midpoint between his thumb and fingertips. As soon as the researcher (sitting opposite to the participant) dropped the ruler, the participant grabbed the meter stick. The vertical distance that the meter stick travelled in centimeters was recorded, then converted into miliseconds.

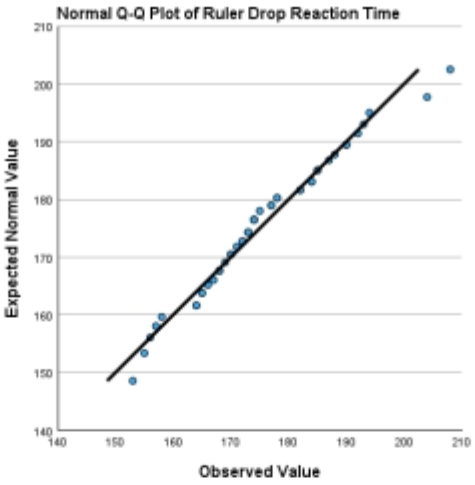
3. RESULTS

The results of statistical tests using the Spearman rho correlation test on the variable level of physical activity showed that of the three types of reaction time, all significant correlation values exceeded 0.05. Meanwhile, for the variable level of cardiorespiratory fitness to reaction time, all three showed a significant correlation value below 0.05. Then the value of the correlation coefficient for visual reaction time is -0.551 indicating a strong relationship, for auditory reaction time of -0.353 indicating a moderate relationship, and for ruler drop reaction time of -0.548 indicating a strong relationship. The direction of the relationship between the three is negative because the correlation coefficient is negative.

	N	Min. (ms)	Max. (ms)	Mean	Std. Deviation
Visual Reaction Time	49	193	301	237,16	23,176
Auditory Reaction Time	49	537	738	619,04	48,537
Ruler Drop Reaction Time	49	153	208	175,53	12,069







Variable		Visual Reaction Time	Auditory Reaction Time	Ruler Drop Reaction Time
Physical Activity Level	Correlation Coefficient	-,049	-,141	-,074
	Sig. (2-tailed)	,740	,334	,615
Cardiorepiratory Fitness Level	Correlation Coefficient	-,551	-,353	-,548
	Sig. (2-tailed)	<,001	,013	<,001

4. DISCUSSIONS

This study aims to find out whether there is a relationship between the components of physical fitness represented by the level of physical activity and the level of cardiorespiratory fitness with the performance component in playing e-sports games, namely reaction time. The main finding that can be underlined in the results of this study is that there is no relationship between the level of physical activity and reaction time in mobile e-sports athletes. Meanwhile, there is a relationship between the level of cardiorespiratory fitness and reaction time.

For the variable level of physical activity to the three different types of reaction time in this study, all of them had a significant correlation value above 0.05 so it could be concluded that there was no relationship. This is not in line with several other studies which have shown a faster visual response in the physically active group compared to the less active physical activity group. One of them is research on college students showing that those who exercise regularly have a faster reaction time when compared to who behave sedentary lifestyles (Jain et al., 2015; Maharani, 2017; Devi and Madhuri, 2017).

The faster reaction time in the physically active group could be due to the fact that when individuals perform adequate physical activity, there is an increase in oxygen demand and skeletal muscles also consume more ATP. This process causes more oxygenated blood to

flow to the muscles from the body and has a positive impact on motor function (Sumiati et al., 2020). Exercise is also known to increase blood flow and oxygen to the brain, so exercise also affects reaction time (Roach et al., 2014). This increase in the amount of blood flow in the brain results in an increase in cognitive function due to an increased supply of the necessary nutrients, such as oxygen and glucose (Sumiati et al., 2020).

The results obtained regarding the absence of a relationship between the level of physical activity and reaction time in research still need to be reviewed from the method used. A more varied distribution of results should improve the quality of the data for analysis, namely when all three categories of physical activity levels are met so that the comparison is wider. Although basically e-sports gamers are characterized by being less physically active or having a sedentary lifestyle (Trotter et al., 2020), so that none of the respondents are in the category of high levels of physical activity. According to the researchers, after using the IPAQ questionnaire it is possible to have a bias in assessing a person's level of activity which will be related to physical capacity. As the IPAQ questionnaire assesses the level of physical activity based on daily activities within 7 days which does not determine the type of activity that is routinely carried out. Most physical activities that affect physical capacity are those that are carried out routinely (Wibowo et al., 2021). This means that consistency in carrying out activities is a more important thing to be assessed as a person's level of physical activity because it approaches the definition of exercise.

In addition, because physical activity can actually prolong the motor response. In one study, not all respondents showed that there was a positive effect after carrying out simple activities (Wulandari and Hadyanawati, 2020). This effect is shown by the longer reaction time after physical activity. This is caused by the fatigue factor felt by the respondents so that more tests need to be carried out to find out how to increase the respondent's reaction speed (Nofita et al., 2019). While the level of physical activity investigated through the questionnaire in this study is the overall activity of physical exertion within a certain period of time which also involves work activities.

Meanwhile, for the variable level of cardiorespiratory fitness based on the results of statistical tests, it shows that there is a relationship with reaction time with the strength of the relationship from moderate to strong. The relationship is negative which explains that the better the level of cardiorespiratory fitness of mobile e-sports athletes, the less reaction time is needed to respond to a stimulus. This is in line with one study which stated that athletes with good aerobic abilities can develop more optimistic reaction times (Teteris and Salite, 2022).

In addition, two previous studies also confirmed similar results through the experimental method of giving exercise. Aerobic exercise improves cardiorespiratory fitness, which in turn has a positive correlation with better reaction times (Hallengren, 2020). In line with that, studies have revealed that cardiorespiratory fitness and reaction time are significantly correlated in e-sports gamers (Dykstra et al., 2021). A recent finding is that increased aerobic capacity adds inverse efficiency score, suggesting that greater cardiorespiratory fitness is correlated with faster and more accurate responses (Dykstra et al.,

2021). This provides further support for consistent physical activity (which improves cardiorespiratory fitness) for short and long term health benefits with the added benefit of improving performance in e-sports games.

Physical activity, and especially aerobic exercise, improves cognitive function, with cellular, brain, and socioemotional changes. Cognitive function itself is defined as a set of multiple core and higher-level mental abilities that include learning, thinking, reasoning, remembering, problem solving, decision making, and attention (Gilson et al., 2023). Based on an explanation of the neurocognitive framework, one study reported that cellular or molecular brain changes underlie structural and functional brain changes, or behavioral/socioemotional changes (Stillman et al., 2016).

Research shows that physical exercise can positively modulate brain anatomy, physiology, and function and thereby improve cognitive performance. Attention, memory, information processing, and task switching abilities are abilities specifically associated with success in gaming (Toth et al., 2020). This process of executive control, which is relevant to performance in most e-sports games (Bediou et al., 2018), is influenced by sport (Kramer and Colcombe, 2018). Especially aerobic exercise appears to be effective for increasing attentional abilities (Toth et al., 2020).

Today, forms of exercise such as aerobics are considered not only to be a preventative measure against health risks, but a means to improve cognitive function, thus giving e-sports gamers reasons to benefit greatly from it (Dykstra et al., 2021). The results of the current study are corroborated by previous research showing that consistent aerobic exercise can increase reaction time (Dykstra et al., 2021). Conversely, someone who has poor physical fitness will also have a bad reaction time (Kosinski, 2013). Basically what can affect the speed of reaction time is depending on the irritability of the nervous system, movement speed, and muscle explosive power (Zulkifli et al., 2019). These factors are part of the body's physiological system and physical capacity that can be affected by detraining events in athletes. This is evidenced by the results of research which states that stopping exercise for a long time will cause a loss of the body's physiological adaptation (Joo, 2018).

Passive lifestyle resulting from intense playing e-sports can not only result in decreased muscle mass and cardiorespiratory fitness. Meanwhile, changing eating patterns to become unhealthy has an impact on metabolic system disorders that can increase the risk of degenerative diseases. In addition, a decrease in the level of physical activity can also cause a decrease in metabolic rate and energy expenditure which results in an increase in body weight (Jakobsson et al., 2020). Although the relationship between body composition (% Body Fat) and reaction time is not established, there is a significant relationship between unhealthy weight gain (or an increase in % Body Fat) and an increased risk of cardiovascular disease risk factors and related health problems (Riebe, 2018) .

While e-sports games seem to promote more towards sedentary lifestyles (Polman et al., 2018), healthcare professionals can use this information to influence and motivate e-sports gamers to engage in aerobic exercise frequently to potentially improve performance in

games so that can be more competitive with additional benefits to improve health parameters. Future research should focus on how various sports designs or physical exercises benefit e-sports gamers in terms of physical and cognitive abilities. Comprehensive physical training interventions can help optimize skills, maximize performance, and as a positive side effect, improve health (Ketelhut et al., 2021).

5. CONCLUSION

There is no relationship between the level of physical activity and reaction time in mobile e-sports athletes. Meanwhile, there is a relationship between the level of cardiorespiratory fitness and reaction time. The direction of the relationship is negative, which means that the better the cardiorespiratory fitness level, the less (faster) the reaction time. E-sports athletes can be advised to do regular exercises to improve their physical fitness. In addition to improving health levels, it is important to understand physical fitness as improving gaming performance.

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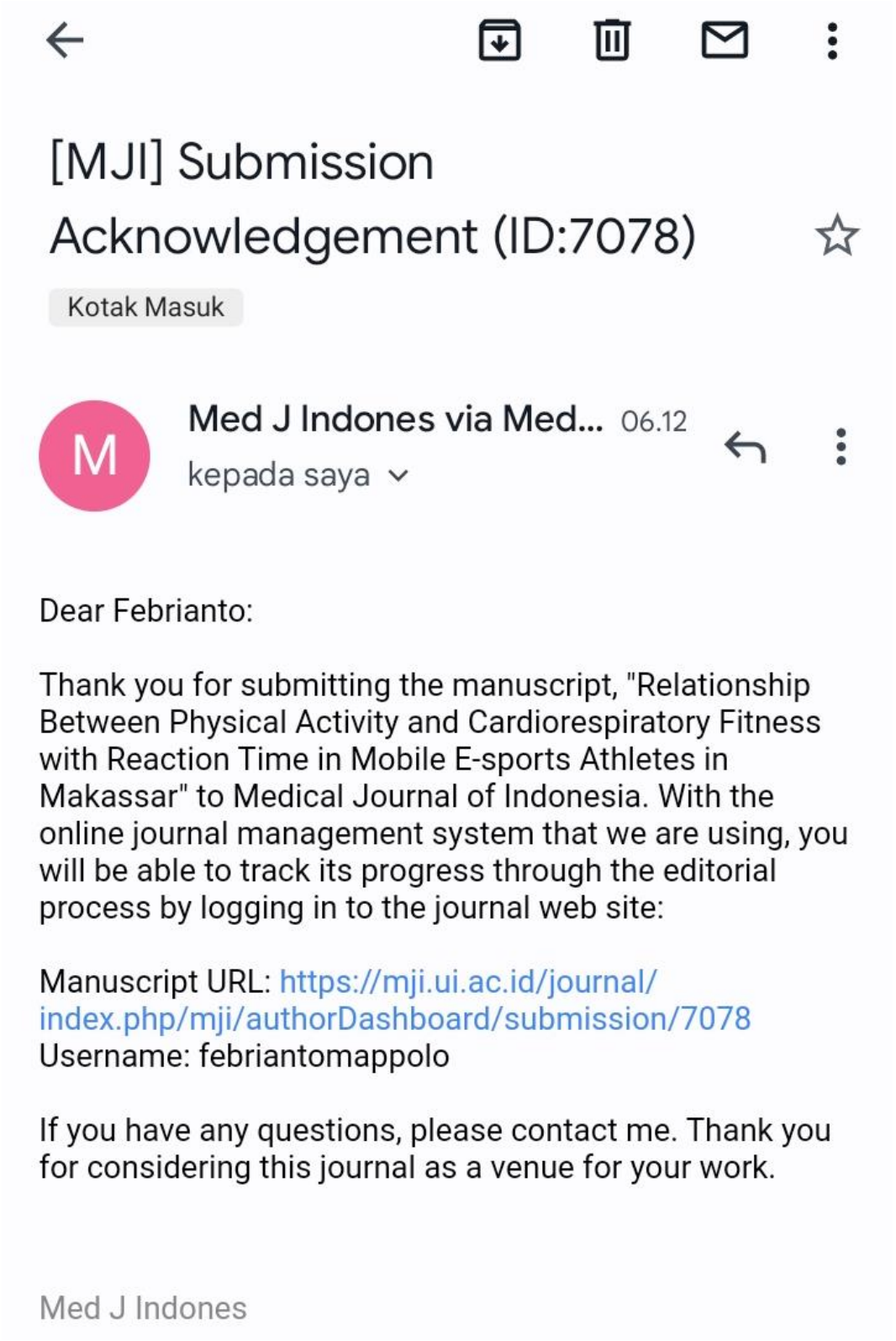

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