Protocol Name/Code: Proprioception, reaction time, strength, and performance of acutely applied exercise bars effect on limb performance

PROTOCOL NAME
PROPRIOCEPTION IN ACUTELY APPLIED EXERCISE BARS, EFFECTS OF REACTION TIME, STRENGTH, AND UPPER EXTREMITY PERFORMANCE.

Protocol Name/Code: Proprioception, reaction time, strength, and performance of acutely applied exercise bars effect on limb performance

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1. TYPE OF RESEARCH	
Observational studies (excluding observational medical device and observational drug studies)	☐
Survey studies	☐
Retrospective archival searches and similar observational studies using file and image records.	☐
Biochemical, microbiological, pathological, and radiological collections such as blood, urine, tissue, and images. studies to be conducted with materials obtained from routine examinations, tests, analyses and treatment procedures	☐
Cell or tissue culture studies	☐
Research involving genetic material that falls outside of gene therapy clinical trials and is aimed at identification.	☐
Research to be conducted within the scope of activities of midwives, dietitians, child development specialists, and physiotherapists.	☒
Diet studies with food additives	☐
Research related to body physiology, such as exercise.	☒
Studies based on anthropometric measurements	☐
All research that does not require direct medical intervention on a person, such as studies evaluating lifestyle habits.	☐

2. NATURE OF THE RESEARCH		
I- Epidemiological	☐ a. Identifier	
	☐ b. Analytical	☐ b.1. Cross-sectional
		☐ b.2. Case-control
		☐ b.3. Prospective cohort
		☐ b.4. Other (please specify)
II-Experimental		
	☒ a. Clinical research	☐ a.1. Open uncontrolled operation
		☒ a.2. Controlled randomized
		☐ a.3. Parallel analysis
		☐ a.4. Cross-examination
		☐ a.5. Single blind
		☐ a.6. Double blind
		☐ a.7. Other (please specify)
	☐ b. Only with laboratory material.	

III. Other types of research	

3. RATIONALE AND OBJECTIVES OF THE STUDY

Rationale for the Study

The shoulder joint is one of the most mobile joints in the body, making it very versatile.

It allows for the performance of movements. It is considered the basic structure of the shoulder girdle.

The glenohumeral joint acts as a bridge between the scapula and the humerus [1]. Wide range of motion

This ability makes the shoulder joint more susceptible to instability problems and injuries. Indeed

Shoulder girdle injuries account for approximately 30-40% of all musculoskeletal injuries.

constitutes [2].

Many parameters influence shoulder biomechanics. Muscle strength, proprioception,

Factors such as balance and neuromuscular control contribute to the preservation of shoulder function, and

They play a joint role in its development [2]. Various methods in the treatment of shoulder injuries

Although available, exercise practices stand out among conservative approaches.

Exercise not only increases muscle strength; it also improves the nervous system and balance.

It has a comprehensive effect by influencing numerous physiological components such as coordination and reaction time.

It provides a healing process [3].

The use of various equipment to support exercises has become a part of current treatment models in recent years.

This has enabled significant progress in integrated rehabilitation practices.

In this context, exercise bars support the rehabilitation process and improve the quality of daily life.

It stands out as one of the effective tools. Resistance and dynamic exercises performed with exercise bars.

These applications increase the activation of the shoulder girdle muscles; improving functional capacity and joint function.

supports its stability [4].

In the field of physiotherapy, there are various processes for both rehabilitation and performance enhancement.

These tools are used. One of these tools, exercise bars, is particularly useful for proprioception and

It has attracted more attention in recent years due to its potential effects on neuromuscular control.

Current studies have shown that when muscle vibration is applied acutely, it increases muscle strength and...

It shows that it can create long-term effects on flexibility [5,6].

However, in healthy individuals, different exercise bars affect proprioception, reaction time,

Studies comparing its effects on muscle strength and upper extremity performance are limited.

Therefore, the aim of this study is to examine the effects of acutely applied exercise bars on proprioception and reaction time.

The aim is to determine the effects of time, power, and changes in upper extremity performance.

The main objective of the study.

The acute application of exercise bars affects proprioception, reaction time, strength, and upper extremity function.

The goal is to determine its impact on performance.

The Secondary Objective of the Study

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4. HYPOTHESIS(ES) / RESEARCH QUESTIONS OF THE STUDY

H0a : : Exercise bar use has no effect on proprioception.

H1a : Exercise bar use has an effect on proprioception.

H0b : Exercise bar use has no effect on reaction time.

H1b : Exercise bar use has an effect on reaction time.

H0c : Exercise bar use has no effect on strength.

H1c : Exercise bar use has an effect on strength.

H0d : Exercise bar use has no effect on upper extremity performance.

H1d : Exercise bar use has an effect on upper extremity performance.

5. STATISTICAL PROCEDURES

The Universe of the Study

Sample Size

This scientific research was conducted by the Faculty of Health Sciences at Aydÿn Adnan Menderes University.

It is planned to be held for students between September 2025 and March 2027. Pulido and

power (Upper Layer Y Balance test) data from the study conducted by his friends

According to the G-Power analysis performed, the effect size was assumed to be f:0.561, resulting in 95% accuracy.

To confidently achieve 85% power, each group must include at least 10 people.

It is seen that [7]. Considering possible losses, 15 in each group for this study

A total of 45 people are planned to be hired.

Statistical and Analytical Methods

The data will be analyzed using the SPSS 22.0 software package. Data will be collected from the participants.

Mean ± standard deviation and categorical variables will be presented as numbers and percentages.

If the normality analyses reveal that the data is normally distributed, then 3X2

(Group x Time) ANOVA test, when data do not show a normal distribution, indicates within-group differences.

Intergroup comparisons will be performed using the Kruskal-Wallis test, in addition to the Friedmann test.

6. STUDY MATERIALS AND METHODS

Study Design/Type

Randomized Controlled Experimental Study

Duration of the Study

18 months (planned to take place between September 2025 and March 2027.)

Location where the study will be conducted

Aydÿn Adnan Menderes University Faculty of Health Sciences

Details of the Study Methodology

This study will be conducted at Aydÿn Adnan Menderes University between September 2025 and March 2027.

The study will be conducted at the Faculty of Health Sciences with male individuals aged 18-35.

For the study, cases were first divided into 3 groups using computer-assisted randomization.

They will be divided. The first group is the Flex-i bar group, the second group is the Theraband Flex bar group, and the third group is...

They will form a Sham bar group. Group 1 will do exercises with the Flex-i bar, while Group 2...

The exercises will be performed with a Theraband Flex bar. The control group will perform the exercises with a rolling pin.

will be carried out. After the group assignment of cases is completed, the age, height and of the participants will be determined.

Demographic information such as weight will be recorded. Then, participants will begin their exercises.

Assessments will be made. The assessment will include proprioception, reaction time, strength, and upper capacity.

This will include extremity performance. Following the initial assessment, each group will...

The child will perform exercises using the exercise material. Measurements will be taken again after the exercises.

Measurements will be taken three times during the evaluations, and the best result will be selected.

will be recorded.

Proprioception Measurement (Joint Position Sense): Before starting the test, the content of the test will be reviewed.

The process will be explained in detail, and a trial run will be conducted. For the test, the participant's back will first be examined.

They will be asked to sit in a supportive chair. Then their eyes will be covered with an eye mask.

It will be closed. A digital inclinometer attached to the wrist with Velcro.

will be installed (Baseline 12-1057 digital inclinometer). The participant will be given a sample by the researcher.

The required levels of movement will be demonstrated, and the participant will be asked to perform these movements themselves.

Then the testing phase will begin, and the individual will be required to actively reach the target angle.

The deviation of the angle from which the individual approaches will be recorded. This process will be repeated 3 times.

will be calculated and the best value will be used as the analysis value [8-10].

Measurement of reaction time: The motor response as a person perceives a visual stimulus.

The time it takes to activate (e.g., pressing a button, reaching for a light) will be measured in milliseconds (ms). Simple

reaction time tests, infrared laser, step panels, motion-based approach

This is accomplished using complex technical equipment such as Blazepod models.

Portable, wireless lighting devices like FitLight Trainer and Reflexlight are used to improve reaction time.

It is among the current equipment used. In this study, the Blazepod reaction timer is used.

Four illuminated devices will be used. The participant will have them placed on a table.

According to the visual stimulus, the person will touch the device's button and turn off the light. The person must press the button.

The press duration will be automatically detected and recorded by the device. Blazepod

Validity and reliability studies of the device have been carried out [11, 12].

Upper Extremity Performance Measurement: Upper Quarter Y Balance for Performance Measurement

The test (Upper Layer Y Balance test) will be used. The person will be in a plank (push-up) position.

(Hands on the ground, feet behind) The arm remains stationary, the arm being tested moves in 3 different directions.

It extends: Medial (inward), superolateral (opposite cross) and inferolateral (outer cross backward) Each

In the extended position, the maximum distance that can be reached with the test arm is measured (cm). 3 repetitions for each direction.

This is done. The furthest distance reached (maximum reach) is recorded. The distance reached is the upper extremity.

normalized according to its length [13].

Force Measurement: Seated Medicine Ball Throw Test (SMBT); en

It is a commonly used test. It is used to measure the explosive power of the upper body and arm muscles.

The participant sits upright against a wall. A 2–3 kg medicine ball is placed at chest height.

It is launched forward with maximum force. The distance traveled is measured (the point of initial contact with the ball).

long distance (cm) is taken [14].

Exercise Equipment

The Flexi bar is an exercise tool designed by German physiotherapists. It weighs 719 g.

It weighs and is 1520 mm long. It has a rubber handle in the middle (17.9 cm) and on both sides

It consists of a flexible fiberglass pole with a rubber weight at the end. It has elastomer properties.

And thanks to its rubber construction, Flexi-bar is protected while remaining physically stable during use.

when it moves strongly within the required range of motion, at a frequency of 5 Hz.

It is designed to resonate. The power that is intended to be generated in the rod, the rod itself...

It can be controlled by changing its weight or thickness. The working principle is...

by shaking the stick to cause the rubber handle to vibrate at 5 Hz, and then...

It is the transmission of vibration from the arm that is held to the whole body [15]. For flex-i bar exercise

The preferred position is for the participant to stand. Different angles may be requested from the participant.

The movements in different positions will be demonstrated. Then the participant will be given a flexibar and

Participants will be asked to hold the exercise bar and swing it correctly according to the desired movements.

In workouts with flexibar, each exercise should be adjusted to account for the possibility of fatigue.

Afterwards, a 1-minute rest period will be given [16,17].

Theraband-Flex Bar is a 30.5 cm long, flexible, durable bar made of natural rubber.

It is an economical exercise equipment. Its textured surface makes it easy to perform movements.

It's easy to understand. It comes in four colors: yellow, red, green, and blue.

The difficulty levels of FlexBars vary according to their color and diameter.

Increasing grip strength by bending or swinging the upper extremities, hands, and feet.

It is preferred for its ability to strengthen and effectively enable soft tissue movements.

[18]. Blue color will be preferred for exercise and 1 minute after each exercise.

A rest period will be given.

Rolling pin; a standard size (100cm) rolling pin will be used in the control group. Each exercise

A one-minute rest period will be given afterwards.

Exercises to be performed: Each exercise will be done for 30 seconds, followed by a 1-minute break.

A rest period will be given.

1. Swing from side to side while keeping your elbow straight.

2. Swinging back and forth with elbows kept straight.

3. Swinging from side to side with elbow bent.

4. Swinging back and forth with elbows bent.

5. With the arm extended outwards and the elbow straight, swing it from side to side.

6. With the arm extended outwards and the elbow straight, swing it forward and backward.

7. Shoulder swing from side to side during external rotation.

8. Shoulder swing forward and backward in external rotation [19, 20]

Description of Procedures During Working Days and Visits

After the study's ethics committee approved it, participants were given information about the study and its characteristics.

will be discussed. Participants who meet the inclusion criteria for the study and who volunteer to participate.

The study will begin with the participants' demographic information.

This will be recorded on the monitoring form, and then the proprioception of their dominant extremities,

Reaction times, strength, and upper extremity performance will be measured using the specified tests. Furthermore...

Then, individuals were given the specified exercises and positions with different exercise bars.

The exercise will be demonstrated, and participants will be asked to perform it themselves using their dominant side.

Further evaluations will be conducted.

Randomization Method and its Importance (if any)

In this study, randomization will be done via the randomizer.org website, with 15 people in each group.

Blindness Method and its Significance (if any)

A single-blind study - the participants in the study group will also have separate BGOG scores.

Participants will not know which group they belong to, but the practitioners will be familiar with the groups.

Ensuring Patient Compliance

Participation in the study was voluntary. Subjects were asked to inform the researchers about the study before making their decisions.

They will be informed. After being informed, if they wish to participate in the research, they can give their voluntary consent.

They will sign the form. Subjects may refuse to participate in the study. This research...

Participation is entirely optional, and if the facts decline, they will not have any say in the matter.

No changes will be made. Furthermore, subjects may withdraw their consent at any stage of the study.

They also have the right to use research results for educational and scientific purposes.

sufficient confidence in the facts that personal information will be carefully protected during this process

will be provided. Data from participants will be collected by the assistant researcher.

Materials to be Used, Storage Conditions, and Responsibilities

The forms and records containing the evaluations to be administered to the participants will be kept for 5 years.

will be kept by the responsible researcher. Necessary for conducting the study.

Baseline digital inclinometer, Flex-i bar, TheraBand FlexBar, rolling pin and Y balance test ADU

It is located in the SBF FTR Department. It is a light source necessary for reaction time measurement.

The measuring device is the Blazepod Ultimate Trainer Bundle device (50,000 TL) and for power measurement.

Aydÿn needs to cover the cost of the 2 kg Domyos medicine ball (1500 TL).

An application is planned to the Adnan Menderes University BAP unit for this research .

No other technical equipment is needed for its execution.

7. SELECTION OF THE POPULATION AND VOLUNTEERS (CASES) TO BE STUDIED

	Woman	Male	Age range
Number of Patients/Cases			
Healthy/Case Count		**45 (in each group)**	**18-35**

		15 people)	
Total Number		**45**	**18-35**

Regulations Regarding the Participation of Volunteers (Cases) in the Study

Participants will be contacted at the Faculty of Health Sciences, Aydÿn Adnan Menderes University.

Participants will be informed about the content and purpose of the study. All participants will be informed about the content and purpose of the study.

The questions will be answered.

Inclusion Criteria for the Study

Being between 18 and 35 years old

Being a man

Not having received physical therapy and rehabilitation services within the last 6 months.

Exclusion Criteria for the Study

Being a woman

Having undergone lower extremity surgery within the last 12 months.

Having a chronic illness

Criteria for Dismissal from Employment and Procedures to be Followed in Such Cases

1. Those who cannot complete the exercises within the study.

2. Those who do not want to fill out the data collection forms or leave them incomplete.

3. Those who wish to withdraw from the research at any stage are excluded from the research.

It will be held and no further action will be taken.

☒ One center

☐ Single center - Multidisciplinary

☐ Multi-center

a) Research Coordinator in Multicenter or Multidisciplinary Research

Ordinary	Last name	Title	Address

b) Centers outside the institution consulted in multicenter studies and

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Those responsible			
Ordinary	Last name	Title	Address

9. RESEARCH TEAM AND PROJECT-SPECIFIC DUTIES				
a) Responsible Investigator				
Name Surname		Title in the Project	Responsibility/contribution	**His signature**
Gürkan GÜNAYDIN,	Associate Professor. Dr.		Project execution and management, data analysis, writing the study	
b) Assistant Researchers				
Ordinary	Last name	Title in the Project	Responsibility/contribution	**His signature**
Beryl	DEMÿRTAÿ	Physiotherapist	Data collection and analysis, writing the study.	

10. INSTITUTIONS AND/OR ORGANIZATIONS SUPPORTING THE RESEARCH	
REVENUES	**TOTAL**
Supportive	☐
Research funds (such as TÜBÿTAK, university research funds, DPT, etc.) This master's thesis study was conducted under the auspices of Aydÿn Adnan Menderes University BAP. An application to the unit is planned.	☒
Other sources	☐

11. MONITORING AND SUPERVISION OF THE WORK
The study will be conducted by the responsible researcher and supervised by the Ethics Committee.

12. REFERENCES

1. Kibler, W. B., and Sciascia, A. (2010). Current concepts: Scapular dyskinesis. British Journal of Sports Medicine, 44(5), 300–305.
2. Kerr, ZY, Collins, CL, & Comstock, R. D. (2010). Epidemiology of weight training–related injuries presenting to United States emergency departments, 1990 to 2007. The American Journal of Sports Medicine, 38(4), 765–771.
3. Behm, D. G., and Sale, D. G. (1993). Intended rather than actual movement velocity Determines velocity-specific training response. Journal of Applied Physiology, 74(1), 359–368.
4. Myers, JB, Laudner, KG, Pasquale, MR, Bradley, JP, and Lephart, SM (2005).
5. Scapular position and orientation in throwing athletes. The American Journal of Sports Medicine, 33(2), 263–271.
6. Marques, MC, Pereira, A., Reis, IG, Van den Tillaar, R., Costa, AM, and Izquierdo, M. (2020). Acute effects of whole-body vibration on muscle strength and flexibility in well-trained athletes. European Journal of Sport Science, 20(3), 371–378.
7. Pulido, V., Alvar, B., & Behm, D. (2023). Bodyblade™ training in athletes with traumatic anterior shoulder instability. International Journal of Sports Physical Therapy, 18(1), 188.
8. Lim, J.-Y., T.-H. Kim, and J.-S. Lee, Reliability of measuring the passive range of shoulder horizontal adduction using a smartphone in the supine versus the side-lying position. Journal of physical therapy science, 2015. 27(10): p. 3119-3122.
9. Pourahmadi, MR, et al., Reliability and validity of an iPhone® application for the measurement of lumbar spine flexion and extension range of motion. PeerJ, 2016. 4: p. e2355.
10. Mourcou, Q., et al., Mobile phone-based joint angle measurement for functional assessment and rehabilitation of proprioception. BioMed research international, 2015. 2015.
11. de-Oliveira, LA, Matos, MV, Fernandes, IG, Nascimento, DA, & da Silva-Grigoletto, ME (2021). Test-retest reliability of a visual-cognitive technology (BlazePod™) to measure response time. Journal of sports science & medicine, 20(1), 179. 12. van der
Leeuw, G., Eggermont, LHP, Shi, L., Milberg, WP, Gross, A.
Hausdorff, J. M., ... and Lipsitz, L. A. (2016). Pain and cognitive function among older adults living in the community. *The Journals of Gerontology: Series* A, 71(3), 398–405.
13. Ruffe, NJ, Sorce, SR, Rosenthal, MD, and Rauh, MJ (2019). Lower quarter- and upper quarter Y balance tests as predictors of running-related injuries in high school cross-country runners. *International Journal of Sports Physical Therapy,* 14(5), 695–706.
14. Wang, D., Gibbons, M., Shung, J., and Hame, S. (2016). Functional testing and return to sport after ACL reconstruction. *Current Reviews in Musculoskeletal Medicine,* 9(3), 330–336.
15. Mischi, M., & Cardinale, M. (2009). The effects of a 28-Hz vibration on arm muscle activity during isometric exercise. *Medicine & Science in Sports & Exercise,* 41(3), 645–653
16. Escamilla, RF, et al., An electromyographic analysis of the shoulder complex musculature while performing exercises using the bodyblade® classic and bodyblade® pro. International Journal of Sports Physical Therapy, 2016. 11(2): p. 175. 17. de Lima Boarati, E., et al., Acute effect of
flexible bar exercise on scapulothoracic muscles activation, on isometric shoulder abduction force and proprioception of the shoulder of individuals with and without subacromial pain syndrome. Clinical Biomechanics, 2020. 72: p. 77-83.
18. Knobloch, K., Gohritz, A., Spies, M., & Vogt, P. M. (2008). Neovascularisation in de Quervain's disease of the wrist: Novel combined therapy using sclerosing therapy with polidocanol and eccentric training of the forearms and wrists—a pilot report. *Knee Surgery, Sports Traumatology, Arthroscopy,* 16(8), 803–805.

19. Doroudian, A., Roostayi, M.M., & Akbarzadeh Baghban, A. (2019). Effect of using the Flexi-Bar tool on erector spinae muscle activation under different standing weight-bearing conditions. *Journal of Bodywork and Movement Therapies,* 23(4), 808–813.
20. Lister, J. L., Wright, T. W., & Manske, P. R. (2016). Flexi-bar exercise induces greater shoulder muscle activation compared to elastic resistance band exercise in healthy individuals. *Journal of Strength and Conditioning Research,* 30(7), 1924–1930.

13. SUMMARY OF THE STUDY

This study will be conducted at Aydÿn Adnan Menderes University between September 2025 and March 2027.

It is planned to be carried out in the Faculty of Health Sciences. This study is acute.

The exercise bars used affect proprioception, reaction time, strength, and performance.

The study will be conducted to determine its effect on limb performance.

It is planned that 45 male volunteer students aged between 18-35 will participate. The participants...

After demographic data were recorded, proprioception, reaction time, strength, and

The performance will be measured. The flex-i bar, TheraBand FlexBar, and sham (fake) bar are also known as rolling pins.

The exercises in the desired positions and angles will first be shown to the participants, then...

They will be asked to perform the exercises using their dominant limb. When the exercises are completed

The evaluations will be repeated and the results recorded.

14.1 THIS APPLICATION FORM IS SUBMITTED ON BEHALF OF MYSELF/THE APPLICANT *(PLEASE CROSS OUT ANY INVALID STATEMENTS AND ADD THE DATE AND INITIALS NEXT TO THEM)*	
	• That the information provided in the application is accurate; • The research will be conducted in accordance with the protocol, regulations, current guidelines, the current Helsinki Declaration, and the principles of Good Clinical Practice; • I informed the research team (including the lab team and the research nurse) about the research, • That the proposed clinical trial is feasible; • I will submit reports of suspected serious adverse effects and safety reports in accordance with relevant guidelines; • I will inform the local ethics committee if there are any changes to the study protocol. • Retention of records (5 years as required by regulation) and notification to authorized persons/authorities (local

	I will submit it when requested by the Ethics Committee. • I acknowledge that the sponsor will cover the costs of non-routine procedures and any expenses incurred by the volunteer during the research, and that the responsible researcher will be held financially and criminally liable if they deviate from the study protocol. • After the research is completed in all countries/our country, I undertake to submit a copy of the final report to the Ethics Committee and the relevant Ministry unit within a maximum period of 1 (one) year.
14.2 RESPONSIBLE RESEARCHER	
14.2.1 First and last name written in handwriting:	
14.2.2 Date (day/month/year): 19/06/2025	
14.2.3 Signature:	