

CURRENT STUDIES IN SPORT SCIENCE

EDITORS

Doç. Dr. Fikret ALINCAK
Arş. Gör. Mehmet VURAL



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CURRENT STUDIES IN SPORT SCIENCE 2022

PREFACE

Current Studies in Sports Sciences 2022, are selected chapters invited by the editors. This book consists of 8 chapters. Physical Activity and Sports in Educational Sciences, Health and Importance, Nutrition Ergogenic Aids for Team Sports, Archery in Turks, Insulin Mechanism and Examination of Exercise Relationship, Parts According to the Purpose of Use in the Ottoman Empire, Team Sports, Isokinetic Test System and Evaluations.

All publications have been reviewed by at least two international referees.

The purpose of the book is to provide readers with the opportunity for scientific peer-review.

Current Studies in Sports Sciences 2022, is published by ISRES Publishing.

This book has been prepared for the basic aspects of sports sciences.

Educational sciences, Health, Nutrition, Ergogenic aids, Team Sports Traditional Sports, Insulin and introduce a new idea for exercise.

We hope that the book will contribute to physical education, traditional sports in the past, healthy life and nutrition. We hope that the book will be useful to new scientists, science readers and sports scientists.

December 2022

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PHYSICAL ACTIVITY AND SPORTS IN EDUCATION SCIENCE

Fikret ALINCAK & Özlem BOZDAL

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1. Introduction

Physical education and sports lessons are an indispensable part of primary, secondary and secondary education programs in our country, as in all developed countries. In accordance with the 12-year compulsory education system, "physical education and game" is taught in primary school, and "physical education and sports" in secondary and secondary education. The knowledge dimension of cognitive domain applications within the framework of traditional learning approach; the adoption of affective domain values and the development of social skills; psychomotor domain includes motor skills and physical fitness (Demirci, 2013). There are different areas in physical education teaching according to the taxonomic approach, these are cognitive, affective and psychomotor areas (Huitt, 2011).

2. Cognitive Field

This area is associated with knowledge acquisition and intellectual development. This area consists of the dimensions of knowledge, comprehension, application, analysis, synthesis, and evaluation, respectively (Başaran, 1997; Collier, 1971).

3. Affective Field

Many factors affect an individual's learning, such as feelings about himself, learning experiences, and the subject. This area covers the adoption of values and the development of social skills. It consists of the steps of receiving, reacting, valuing, organizing and personalizing (Bunker & Thorpe, 1982; Fidan, 1992; Erden & Akman, 1996).

4. Psychomotor Field

It includes motor skills and physical fitness. The first goals focus on the development of basic movements and perceptual skills, while the later goals focus on the development of physical fitness and higher-level movement skills.

It consists of the steps of perception, establishment, doing with a guide, mechanization, making it a skill, adaptation, and creation (Çilenti, 1979; Ergin, 1998; Kaya, 2006; Harlow, 1972).

5. Teaching Styles in Physical Education

In addition to the two main styles determined as student and teacher centered, the range of teaching styles developed by Mosston and Ashworth has been used in the field of physical education and sports for 50 years (Mosston and Ashworth, 2002). The fan is as follows;

A	B	C	D	E	F	G	H	I	J
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The spectrum shifts from teacher-centered (A-E) to student-centered (F-J). At the same time, it shifts from imitating and duplicating the movement, that is, from the presentation stage (A-E), to the production of new movement-information, that is, towards the invention stage (F-J). Each style consists of preparation, application and evaluation phases. At the same time, the teaching

behavior learning behavior-goal relationship in the styles A-E tends to the teacher. In the F-J cluster, however, they tend to be students (Chatoupis & Emmanuel, 2003; Mosston & Ashworth, 2002).

Styles A-E contain precise information or sports movements that have no alternative. The F-G cluster represents styles that support exploration, while the H-J cluster includes the development of alternative designs (Griffin et al., 1997; Mosston & Ashworth, 2002; Hellison, 2011).

5.1. Command Style

The teacher is active during the preparation, implementation and evaluation phases. The student puts the given warning into practice directly and immediately. Considerations (Mosston and Ashworth, 2002);

- The subject is fixed, the subject is learned through repetition, the subject should cover a single standard/achievement,
- Individual differences cannot be taken into account
- The tone, clarity, speed of commands are important for the group
- Repeating the same command over and over is tiring
- The teacher makes 9 important decisions
- The teacher is responsible for the consequences of decisions

5.2. Practice Style

The teacher is active in the preparation phase, the student in the implementation phase, and the teacher in the evaluation phase. The teacher should determine the subject and make the evaluation. The student will continue the implementation phase himself. The decisions in the implementation phase belong to the student. However, these decisions are with the teacher during the preparation and evaluation phase. Considerations (Mosston and Ashworth, 2002; Metzler, 1990);

- It is used in learning that is done in a certain order and there are no alternative ways.
- The student can experience the beginning of independence
- Movements must be able to be defined as true or false
- It is necessary to pay attention to the development of the student's decision making.
- The student must be trusted to make 9 important decisions
- Students are responsible for the consequences of decisions

5.3. Pair Working Style

In the preparation phase, the teacher is active, in the implementation phase the student is active, and in the evaluation phase, the observer/partner is active. The teacher determines the subject, while one student practices, the other student evaluates the student who practices according to the criterion paper designed by the teacher (1 peer feedback-1 teacher feedback). At the end of

the application, the roles are repeated by changing. Considerations (Metzler, 2017; Mosston & Ashworth, 2002);

- Develops socialization process
- The active role of the student expands
- Paper consisting of criteria containing the steps of the movement should be used.
- The student must be trusted to make 9 important decisions
- The observer should be trusted to be able to evaluate with the criteria paper
- The student is responsible for the results of the decisions, and the observer is responsible for the results of the evaluation.

5.4. Self-Control Style

The teacher is active in the preparation phase, the student is active in the implementation phase, and the student is active in the evaluation phase. The teacher determines the subject, the student evaluates himself according to the criterion paper designed by the teacher at the same time while he is practicing (1 student feedback-1 teacher feedback).

The decisions in the implementation phase belong to the student. Considerations (Mosston & Ashworth, 2002; Metzler, 2017, Metzler, 1990);

- Develops self-evaluation skills
- The active role of the student expands
- Paper consisting of criteria containing the steps of the movement should be used.
- The student must be trusted to make 9 important decisions
- The student should be trusted to be able to self-assess with the criterion paper
- The student is responsible for the results of the decisions and evaluation

5.5. Participation Style

The teacher is active in the preparation phase, the student is active in the implementation phase, and the student is active in the evaluation phase. It can be used in lessons taught with heterogeneous groups.

The teacher determines the topic and prepares tasks of different difficulty levels. It is left to the student to decide which task will be applied, and the student chooses the appropriate level. The student evaluates himself/herself according to the criteria paper designed by the teacher at the same time while practicing. The decision in the application phase belongs to the student. Considerations (Yavaş and İlhan, 1997; Mosston and Ashworth, 2002; Metzler, 2017, Metzler, 1990);

- Develops self-evaluation skills
- The active role of the student expands
- Paper consisting of criteria containing the steps of the movement should be used.
- The student must be trusted to make 9 important decisions

- The student should be trusted to be able to self-assess with the criterion paper
- The student is responsible for the results of the decisions and evaluation

5.6. Directed Invention Style

In the preparation phase, the teacher is active, in the implementation phase, the teacher-student is active, and in the evaluation phase, the teacher-student is active. In the preparation phase, the teacher makes all the decisions and prepares the questions to guide the student. In the application phase, the student tries to discover the answers and the common result of the answers in accordance with the questions asked. In the exploration process, the student and teacher evaluate the accuracy of the answers. Considerations (Yavaş and İlhan, 1997; Mosston and Ashworth, 2002; Metzler, 2017, Metzler, 1990);

- Develops exploration skills
- The student learns to enter the logical sequence process
- The target topic must be discoverable
- The teacher and the student are responsible for the results of implementation, decisions and evaluation

5.7. Problem Solving Style

In the preparation phase, the teacher is active, in the implementation phase, the student-teacher is active, and in the evaluation phase, the student-teacher is active. There are two types of problem-solving style; (1) the only way of solution and (2) the way of producing different solutions. In one, a single solution to the problem is sought, while in the other possible different solutions are sought. The most important aspect of the style is that it provides the student with cognitive dissonance (while trying out solutions). The teacher prepares the only question that he will direct the student by making all the decisions in the preparation phase, it is a very difficult and cognitively challenging process for the teacher. In the application phase, the student produces the solution/ways in accordance with the problem posed and tries them on the problem. The student and the teacher evaluate the correctness of the answer and solution path. Considerations (Yavaş and İlhan, 1997; Mosston and Ashworth, 2002; Metzler, 2017, Metzler, 1990);

- Develops problem solving skills
- The student learns to develop procedures involving cognitive processes
- The target topic must be discoverable
- The student is responsible for the application, the teacher and the student are responsible for the results of the evaluation

5.8. Personal Program-Students' Design Style

In the preparation phase, the teacher is active, in the implementation phase, the student-teacher is active, and in the evaluation phase, the student-teacher is active. The teacher identifies only a general subject during the preparation phase. In the application phase, the student creates a special focus within the framework of the general subject, discovers the problems and solutions about them. Decides which sub-topics the special focus will consist of. The teacher, on the other

hand, answers questions about the application of the style and examines how the students are progressing. Considerations (Yavaş and İlhan, 1997; Mosston and Ashworth, 2002; Metzler, 2017, Metzler, 1990);

- Develops analysis, synthesis and problem solving skills
- The student learns to develop procedures involving cognitive processes
- The target topic must be discoverable
- The student is responsible for the application, the criteria and the results of the evaluation.

5.9. Student Start-Up Style

Student-teacher is active in the preparation phase, student-teacher is active in the implementation phase, and student-teacher is active in the evaluation phase. The student makes all the decisions in the preparation phase, and for the first time in the spectrum, the student has been active in the preparation phase. In the implementation phase, the student puts the lesson plan planned in the preparation phase into practice. Usually this style is based on the participation of a single student. In the evaluation, the student evaluates the application within the framework of the criteria he has created. The teacher guides the student through all stages. Considerations (Mosston and Ashworth, 2002);

- Requires high education level
- The student should have sufficient knowledge of course design
- The teacher should provide the student with the opportunity for this design
- The student is responsible for the decisions and the criteria and results of the evaluation.

5.10. Self-Learning Style

The student is active in the preparation phase, the student is active in the application phase, and the student is active in the evaluation phase. This style does not occur in the classroom setting. Its defining feature is individual effort and willingness to learn. The individual participates in both student and teacher roles. Considerations (Mosston & Ashworth, 2002; Metzler, 2017);

- Requires high education level
- It is used when the individual is busy with self-teaching
- The teacher has no influence
- The student is responsible for all factors.

6. Teaching Models in Physical Education and Sports

Teaching models in physical education consist of eight topics developed by Metzler. Model use is important for teaching. A model meets certain types of learning needs, but does not include all learning needs (Metzler, 2017, Metzler, 1990).

The benefits of using models in teaching can be listed as follows (Metzler, 1990);

- Provides a consistent approach to teaching,

- Clarifies priorities,
- Offers theme,
- Provides an understanding of current and future learning events,
- presents a unified theoretical framework,
- Supports technical language,
- Provides confirmation of the relationship between learning and teaching,
- Provides a valid assessment,
- Helps in decision making,
- Supports learning outcomes.

Before deciding on a model, it is important to know the strategy areas related to physical education and sports lesson and to plan a model accordingly. Strategy areas related to physical education and sports lessons; (Metzler, 2017, Metzler, 1990).

- Managerial strategies: preventive, interactive, grouping
- Instructional strategies: task presentation, task structure, task engagement level, learning activities, task functioning, student safety, closure
- Knowledge domains for teaching: learning contexts, learners, learning theories, developmental relevance, goals, content, assessment, social-emotional climate, equity, curriculum.

6.1. Direct Education Model

The teacher is the source of all decisions about content, management and participation in this model. It is mostly used for teaching movement patterns and concepts. In the model, psychomotor learning, cognitive learning, and finally affective learning come first, respectively. It offers very few choices to the student. Its assumptions and responsibilities are as follows (Metzler, 2017, Metzler, 1990);

Teaching assumptions;

- The teacher is the main source of content and decisions.
- The teacher should determine the content and create learning tasks in the content.
- The teacher is the most important source of knowledge.
- The teacher is the person who uses the environment, time and resources in the best way.

Learning assumptions;

- Learning takes place as students progress through tasks created by the teacher.
- Students clearly understand the tasks and criteria beforehand.
- Learning is the result of immediate repetitive behavior.
- Students must have a high level of participation in the application.

- High participation rate should be combined with feedback.

Responsibilities

- Starting the lesson: The teacher invites all students to the designated area.
- Bringing-taking the materials: All the materials that will be needed are determined by the teacher. The knowledge of how to use the materials is explained to the students by the teacher and the materials are transported with the help of the students.
- Attendance: The teacher takes attendance and uses time effectively.
- Task presentation: The tasks determined by the teacher are transferred to the students by the teacher.
- Task structure: Planned by the teacher.
- Evaluation: The criteria for the tasks are determined by the teacher.
- Content progression: The teacher decides when the learning task ends and the next one begins.

6.2. Individual Teaching Model

It is a model that allows each student to progress at their own pace with predetermined learning tasks. Each student progresses individually in learning tasks. While the teacher is the source of decisions about content in this model, management and participation decisions will vary from student to student. It is more suitable for students with prerequisite skills. Not suitable for preschool or primary school. Its assumptions and responsibilities are as follows (Metzler, 2017, Metzler, 1990);

Teaching assumptions;

- Teaching tasks can be provided with written or visual resources; the teacher is not the only resource.
- The main task of the teacher is to provide motivation to the students in the application phase after preparing the content.
- The student who remains independent from the teacher learns more effectively.
- The teacher takes the planning decisions according to the speed of the student in the learning process.

Learning assumptions;

- Learning takes place with little dependence on the teacher.
- Students learn content at different rates.
- Students have different capacities for learning.
- Most students achieve their goals if given enough time.
- Students take responsibility for independent learning.

Responsibilities

- Starting the lesson: Each student determines their own start.
- Bringing and taking the materials: The teacher brings the materials that will be needed to the class and the materials are carried by the students after the students use them.
- Attendance: The teacher checks on the students as the students continue their learning tasks.
- Task presentation: Students read or view the task presentation at the beginning of the task.
- Task structure: Students arrange each new task according to written instruction.
- Evaluation: Students self-evaluate some tasks, some are evaluated by their peers, and some are evaluated by the teacher.
- Content progression: The student decides when the learning task ends and the next one begins.

6.3. Collaborative Learning Model

It is a model in which students are grouped into learning teams with the expectation that they will contribute to the learning process and results. Students progress with their teams on learning tasks. While the teacher is the source of the decisions about the content in this model, after the learning teams are formed, the management and participation decisions are in the learning teams. Their assumptions and responsibilities are as follows (Metzler, 2017, Metzler, 1990; Rosenshine, 1983; Slavin, 1980; Slavin, 1983);

Teaching assumptions;

- The main role of the teacher is to facilitate the learning of the students.
- The teacher can act as a facilitator after establishing the structure of group tasks.
- The teacher takes part in monitoring and directing the social learning processes.
- The teacher should strike a balance between social and academic goals.

Learning assumptions;

- Social and academic learning is encouraged.
- Better efficiency is achieved when groups are heterogeneous and the same group works together on several learning tasks and units.
- The performances of all group members should be included in the group score by individual evaluation.
- Roles should be determined in which all group members can contribute.

Responsibilities

- Starting the lesson: The teacher decides what to teach the students and starts the lesson by forming groups.

- Bringing and taking the materials: The teacher brings the materials that will be needed to the class.

- Attendance: The teacher checks the students while the teams are being formed.

- Task presentation: The teacher presents the tasks to the teams.

- Task structure: The teacher decides according to the cooperative learning strategy that each student can participate in. Initially, students manage the tasks, but if they are not successful, the teacher acts as a reflector.

- Evaluation: The teacher presents the evaluation of the students with the rubric. Teams use this table to get the best score.

- Content progression: The teacher decides when the learning task ends and the next one begins, but the speed of reaching the goal can be determined by the team.

6.4. Sports Education Model

All duties and responsibilities that may be in a sports organization are given to students in the form of an organizational chart. The student not only learns to be an athlete, but also learns duties such as coach, manager, referee, participant, spectator, statistician, field officer. A semester or at least 20 weeks are planned as a SEASON, and the course order proceeds in this way. Its assumptions and responsibilities are as follows (Metzler, 2017; Siedentop, 1994; Siedentop, 1998). Plans to be used in a season;

1. Season: It is a planning of at least 20 classrooms that includes periods such as preparation period, competition period, transition period.

2. Team membership: students attend the lesson as a member of the same team throughout the semester. Affective and social characteristics develop.

3. Official competition: students draw up the rules of the game and the rules of the competition. They can prepare the competition calendar.

4. Concluding activity: a concluding activity that can take place at the end of the season in a festive atmosphere is carried out with the planning of the students in the lesson.

5. Statistics: Students record the characteristics of their own teams and rival teams, and in this way their analysis skills improve.

6. Festival: The necessary preparations are planned by the students to maintain the sports competitions in a festive atmosphere.

Its assumptions and responsibilities are as follows (Metzler, 2017, Metzler, 1990);

Teaching assumptions;

- The teacher can use other teaching models to teach different roles.

- The teacher does not control every learning task, but acts as the main resource.

- The teacher guides students for behaviors in sports activities and facilitates learning opportunities.

Learning assumptions;

- With appropriate guidance and facilitation, students can take on many responsibilities at the end of the season.
- Students work collaboratively to achieve group goals.
- Under the guidance of the teacher, students can determine the sports branch that suits them.
- Offers real authentic sports experience.

Responsibilities

- Deciding on the branch and organization of the season: The teacher decides or selects students from the list prepared by the teacher. In the organization of the season, the teacher determines the basic structure, and special procedures are set by the students. A sports committee, usually made up of students, is formed and captains are determined. The teacher guides the assigned students about their duties.
- Determining the rules: While the teacher determines the basic rules, the students determine the game rules through the sports board.
- Execution-preparation-management of the teams: Captain, coach and administrative students are responsible for the teams.
- Bringing and taking the materials: The students are responsible.
- Game organization: Sports committee and referee students are responsible.
- Scoring: Statisticians and referees are responsible for students.
- Evaluation: The captain and coaches evaluate the athletes. In addition, statisticians evaluate the performance of athletes. The sports board evaluates all officials.

6.5. Peer Teaching Model

It is based on students teaching other students, but is not used in the same sense as peer learning or cooperative learning. In these two models, the student is not given full responsibility, and in cooperative learning, the students in the team continue the learning activity at the same time. In peer teaching, the student is given full responsibility. The teacher takes all the decisions regarding content, management, assignment and instruction, but the responsibility for the instructional interactions part rests with the peer tutor to observe and analyze implementation efforts. In fact, it is close to the direct learning model. Its assumptions and responsibilities are as follows (Metzler, 2017, Metzler, 1990; Siedentop, 1998);

Teaching assumptions;

- The teacher retains control of the content, management, task presentation and progression.
- The teacher can train peer tutor students.

Learning assumptions;

- Psychomotor learning is facilitated by feedback from peer tutors.

- Cognitive learning is facilitated by the analysis and instruction of peer tutors.
- Affective learning is facilitated as students take on different roles.
- Develops problem solving skills.

Responsibilities

- Starting the lesson: The teacher starts it.
- Bringing and taking the materials: The teacher brings the materials that will be needed to the class.
- Attendance: The teacher takes attendance.
- Task presentation: The teacher presents the task and the peer tutors show it to the learners.
- Mission structure: Same as mission presentation.
- Evaluation: The teacher determines how the evaluation will be. Peer tutors evaluate learners with checklists.
- Content progression: The teacher decides when the learning task ends and the next one begins.

6.6. Inquiry Teaching Model

This model gives priority to the cognitive domain. Its assumptions are as follows (Metzler, 2017);

Teaching assumptions;

- The teacher encourages the student to think and question.
- The teacher prepares multi-faceted, research-promoting questions.

Learning assumptions;

- The learning content should be meaningful to the student.
- Cognitive learning precedes psychomotor learning.
- The student tries to solve the problem with his previous learning.
- Develops problem solving skills.

6.7. Tactical Game Model

It is the basis of conceptualizing game teaching. It aims to teach the basic principles of sportive games and to comprehend the game structure and tactics. It is a model in which students produce solutions to problems by acting according to the changing conditions in the game. The functioning of the model is as follows (Metzler, 20197; Siedentop, 1998);

- The game is introduced,
- Interest is drawn by mentioning the history of the game,
- Tactical problem presented,

- The importance of tactics and how it is used are shown with game-like learning,
- Tactical knowledge is combined with skill in the game,
- The actual form of the game is played.
- During the real form of the game, the teacher can enter the game as a player, or pause the game momentarily and ask strategic questions. The assumptions and responsibilities of the model are as follows (Metzler, 2017, Metzler, 1990);

Teaching assumptions;

- The teacher identifies the tactical problem.
- The teacher organizes different forms of sportive play to support tactical and skill development.
- The teacher is the main resource, providing students with learning opportunities.

Learning assumptions;

- Participating in the game is interesting from skill exercises for the student.
- The student must develop both performance knowledge and tactical knowledge in order to perform well.
- The level of learning increases with the constructivist approach.

Responsibilities

- Starting the lesson: The teacher starts it.
- Bringing and taking the materials: The teacher brings the materials that will be needed to the class.
- Task presentation: The teacher presents the task, expresses the tactical problem, while the students begin to think about the solution of the tactical problem.
- Task structure: Students organize each task as directed by the teacher.
- Evaluation: The teacher should design an evaluation technique for each task.
- Content progression: The teacher decides when the learning task ends and the next one begins.

6.8. Individual and Social Responsibility Teaching Model

It aims to reintegrate young people at risk into society. The main idea is that the content in physical education programs provides students with opportunities to practice and learn how to take responsibility for themselves and others. This model works in accordance with the standard content of physical education programs. The model has five levels and learning areas (Metzler, 1990; 2017);

Level 1.	Respect for the rights of others
Level 2.	Collaboration, participation and effort

Level 3.	Self-management-self-direction
Level 4.	Helping and leading others
Level 5.	Non-physical education-transfer to life

The assumptions and responsibilities of the model are as follows (Metzler, 2017, Metzler, 1990);

Teaching assumptions;

- Responsibility can be taught at a high level in good faith.
- In teaching, students are provided to make positive personal and social decisions.

Learning assumptions;

- Learning should be student-centered
- The activity content should be meaningful and positive for students and provide ample opportunities.
- Equal progress should be ensured.

Responsibilities

- Starting the lesson: The teacher starts the lesson from the perspective of the students' level.
- Task presentation: The teacher presents the task separately for each activity.
- Problem identification: The teacher determines the problem area by observing the students.
- Select activity: It is chosen by the teacher. The objectives of the activity are presented to the students. The missing points are discussed.
- Evaluation: The teacher specifies the issues that will cause problems to the students and the parameters they expect for their solution.
- Content progress: It is under the control of the teacher according to the status of the students.

7. Assessment and Evaluation in Physical Education

Measurement in the field of sports should be handled in three stages (Siedentop, 1994; Rosenshine, 1983);

- Recognition: Readiness tests, observation, interview, ability tests are used to determine the beginning levels of students.
- Monitoring-shaping: tools such as monitoring tests, practice activities, structured grid, diagnostic branched tree, word association, self-peer assessment, group assessment, projects, observation forms are used to eliminate learning deficiencies and improve learning.

- Result-product: final exam, practice exam, observation, interview forms, projects are used to determine the level of the student in terms of achievements.

8. Feedback in Physical Education Teaching

Feedback is the information system after the movement about all stages of the movement. It is divided into two as internal and external (Mosston and Ashworth, 2002).

1. Internal feedback is the evaluation of the information received from the sensory receptors of the person performing the movement.

2. External feedback, on the other hand, is when someone other than the person performing the action informs about the result of the action or the performance. As understood from the definition, external feedback is either directed towards the result of the action or is directed towards the stages of performance. External feedback is the term that comes to mind when it comes to “feedback”. Feedback can be given from audio, visual, video recordings and biofeedback (such as health data). It has 4 main effects. These are (Mosston and Ashworth, 2002; Griffin et al., 1997);

- Motivation: Getting information about the individual's performance in the learning of the movement motivates the individual about learning,

- Reinforcement: Particularly positive feedback reinforces the emergence of the desired behavior,

- Providing information: The main task of the feedback,

- Dependency: Too frequent feedback leads to the habit of ignoring internal notifications, damaging the learning of the movement. In other words, as the frequency of feedback increases, regression can be seen in learning.

According to Mosston and Ashworth, the types of feedback are as follows (Mosston and Ashworth, 2002; Griffin et al., 1997);

- Value statements: reflect feelings about performance. It can be positive or negative. It should include judgment. Expressions such as very good, great shot, very bad, successful. It is used to motivate students.

- Corrective statements: statements containing corrections to performance or result. Intensive use can lead to the proliferation of errors. Excessive use may prevent further trials. It is used in two ways; either reveals the error (like you didn't make the right move, it's wrong), or gives information on how to correct the error (like you are holding your racket wrong, you should turn your wrist inward). Statements such as stop, don't, enough are also vague corrective statements.

- Impartial (neutral) statements: It does not contain corrections and judgments, giving information about the performance. Overuse may cause the notification recipient to become alienated from learning the skill. Two of the five shots hit the goal, you ran in 15 seconds, you completed 28 sprints. It has little effect on learning.

- Ambiguous statements: these statements do not provide information about performance, value, explain the error and how to fix it. Overuse will cause misunderstandings

and hinder learning because one will have to guess the meaning of the expression. Repeat, it was interesting, it's not bad, it could be better. It has little effect on learning.

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HEALTH AND IMPORTANCE

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1. Introduction

The fact that the concept of sport has become a huge sector as time goes on, has led to an increase in the expectations of people and other formations from the athletes and the clubs. Of course, the basic system for the success of countries and sports clubs in the national and international arena is to reveal the best performance of the athletes and sports clubs in a healthy way. Therefore, the sports science, health scientists and social scientists, which are much more closely related to another subject, increase the quality and number of scientific studies in order to develop this field and the athlete. Sportive performance includes all of the physical and physiological efforts that an athlete regularly reveals while performing a sportive task. In revealing this performance, the importance of all kinds of internal and external factors should be taken into account, whether in the competition environment or during training (Bayraktar & Kurtoğlu, 2004).

Regardless of the sports branch in which the athlete is interested in professional or amateur level, it is necessary to see everything as a whole. The athlete's psychological state, social life, personal thoughts and dreams, physical and physiological capacity, working environment and training environment affect the athlete's health, sportive success and sportive performance significantly (Walker et al., 1987). Based on this information, in this section; In order to create the necessary sportive performance, it is aimed to compile and present the necessary information about the health and importance of the athletes, which is important for the clubs and countries to be at the forefront in national and international platforms.

2. Definition and History of Sports

Sport emerges as a social element that reveals unity and solidarity in a healthy way, based on brotherhood and friendship, and has its own rules and order, together with the state of being in a certain state of balance. Sport has entered into a certain formation with the beginning of people living together as a society chronologically. As it was known in long ago, wars were mostly won through physical strength. At that time, sports were seen as a kind of preparation for wars. This is clearly stated in a definition made on sports; It is a disciplined and regular type of game that is built on sports, struggle and competition, maturing and developing warrior-like forces and people (Erkal, 1978). In another definition, sport is a unifying, integrative, socio-cultural and competitive phenomenon that reveals and develops the existing abilities of a person, performed individually and collectively, with or without tools, within the framework of predetermined rules (Erkal, 1982).

As time passed and humanity underwent different changes, sports emerged in different forms and shapes accordingly. The factors that play a role in the transition of people from the traditional society structure to the modern society structure have also caused sports to undergo a change. With this change, sportive practices for different purposes took shape within the framework of the determined rules and started to be referred to as a set of planned and regular

movements called sports today. In this context, sports are as old and meaningful as our human history (Çumralgil & Görücü, 2007).

Today, all countries have become aware of the transforming and impressive power of sports on the cultures of the world. Accordingly, they saw sports as a driving force in social dynamism and as a factor that activates social dynamics. Thus, politics has been seen as a tool of social and cultural change and interaction. Moreover, it has become the largest industry branch in today's world. Sports marketing, organizations, sponsorship and professional contracts bring this branch to the fore (Arıpınar & Doruk, 2011).

Health

According to the World Health Organization, health is defined as “a state of complete physical, social and mental well-being and not merely the absence of disease or infirmity”. It is accepted that health is a fundamental right for all people (Nutbeam, 1998). It is aimed to eliminate or minimize the existing health barriers to protect health. In case of disability or illness, it is necessary to prevent the situation from worsening (Madi & Hussain, 2008). Health awareness refers to all the behaviors that people believe and live in for the protection of general health and the development of health. In other words, it can be said to be any activity carried out by individuals who think or feel that they are healthy, in order to prevent diseases (Walker et al., 1987).

3. Internal and External Factors Affecting Athlete Health

Basically, an individual should be considered in all aspects. Evaluation of the athlete in the same way is important in terms of athlete's health and performance. An athlete's physiological, psychological, physical and environmental factors should be affected positively or negatively, and these should be considered as a whole in the health and performance of the athlete and all of them should be brought to positive and good levels. These factors can be classified as internal and external factors. Intrinsic factors can be said to be the genetic code, physiological capacity and mental state that the athlete has brought from birth. External factors, on the other hand, can be said to be the environment in which the athlete lives, nutrition, people, trainer and athlete individuals, weather and physical environment conditions. Although the effect of other factors cannot be underestimated, the nutrition and training level of the athlete are more prominent (Walker et al., 1987; Madi & Hussain, 2008).

4. Nutrition Principles for Athletes

The primary purpose of nutritional supplementation in athletes is to increase the adaptation to physical and physiological loads to higher levels by meeting the energy needs and nutrient needs that are parallel with increasing loads (Andaç et al., 2020). These nutrients and energy types that should be taken vary according to the demographic characteristics of the athletes, their metabolic status, and the intensity and duration of exercise. One of the problems encountered here is that the athlete cannot supplement with sufficient energy. There are 6 basic nutrients that athletes need. These; carbohydrates, proteins, fats, vitamins, minerals and water. These nutrients have separate functions in our body. Athletes should take enough nutrients and energy elements to increase their performance during exercise and competition, to improve recovery phases and durations at rest, to maintain optimum body weight, and to keep energy stores adequately (Rodriguez et al., 2009). Sports-specific physiological requirements for

competitions and trainings are a whole, including adequate and balanced nutrition (intake of appropriate macro and micronutrients), providing nutritional diversity and fluid consumption as much as the amount lost. Thus, reducing the risk of injury in heavy training, reaching the highest performance in the sport of interest and reaching the ideal body composition of the athlete are supported (Kolukısa & Eyipınar, 2020).

5. Energy Requirements in Athletes

Nutrition and diet programs created for athletes should primarily be in a way that meets the energy needs of the athlete in a special way. In order to achieve success in sports, it is important to establish a very good balance of nutrition and energy. 55-60% of the energy that a healthy individual should receive during the day consists of carbohydrates, 25-30% fats and 12-15% proteins (Saris & Van Loon, 2004; Rodriguez et al., 2009). Compared to normal individuals, energy expenditure is 2-3 times higher in athletes. As mentioned before, this requirement varies according to the type, intensity and duration of the exercise (Ersoy, 2012; Çavdar et al., 2018). Dietitians, who are responsible for the creation of diet and nutrition programs for athletes, generally prefer the Harris-Benedict equation. Energy needs of athletes are calculated by basal metabolic rate and physical activity type. The daily energy intake can be calculated by multiplying the basal metabolic rate and the appropriate physical activity factor. As the type and intensity of physical activity increases, the need for energy increases accordingly (Mengi, 2016).

6. Fluid Requirements in Athletes

Water constitutes approximately 60% of the human body and is important for all vital activities. In addition to these, it also has important functions such as regulating body temperature and sweating in the physiological context. For athletes, water is very important for muscle strength because 75% of the muscles are composed of water (Cerit, 2016). Athletes have to pay attention to fluid consumption in order to maintain adequate hydration (meeting the water requirement) and exercise capacity (Kerksick et al., 2018). As long as adequate hydration is not provided for the human organism, the amount of blood and oxygen reaching the muscles decreases, the temperature inside the body rises and performance and health are adversely affected. Dehydration is inevitable when 2% or more of the total weight is lost as water. If this situation occurs in athletes, adverse effects are observed in muscular strength, endurance and other biomotor features (Grout et al., 2016; Kerksick et al., 2018). Ensuring adequate fluid intake is very important for optimal health and athletic performance. Therefore, adequate fluid intake should be taken before, during and after exercise (Rodriguez et al., 2009; Şakar, 2009).

7. Ergogenic Support for Sports Performance

Externally provided ergogenic supports can be said as mechanical technologies, nutritional contents, drugs and psychological methods that can increase sports performance and adaptation to exercise. In the field known as nutritional supplements, there are supplements that can be used in the form of tablets, capsules and gels or as powders. They are used to increase performance and improve body composition. The unconscious use of these products for the purposes of increasing performance and focusing on the target should also be prevented. These ergogenic aids can increase performance, but it is necessary to use the right product at the right

rate, in the right form and at the right time (Argan and Köse, 2009; Thomas et al., 2006). The ergogenic aids used by athletes are mainly as follows;

Creatine; It is formed by the combination of the amino acid methionine, glycine and arginine. It is a highly effective ergogenic nutritional supplement for athletes to increase performance capacity and lean body mass (Kerksick et al., 2018).

Caffeine; most naturally produced stimulant found in food ingredients such as coffee, tea, guarana, non-alcoholic beverages, and chocolate. Intake of this nutrient; It provides a physiological contribution by triggering the release of adrenaline in the blood circulation. Since the adrenaline released during exercise allows the fatty acids to be released more and earlier, the fat burning phase is faster (Kerksick et al., 2018; Grout et al., 2016). In an experimental study, it was reported that up to 6 mg of caffeine supplement intake per body weight (kg) could improve both sportive performance and cognitive function (Ozan et al., 2022).

Glutamine; It is the most abundant but non-essential amino acid in our body. It has important functions for our body. Along with increasing exercise capacity, it stimulates protein and glycogen synthesis, and accordingly, it provides muscle tissue growth and repair. In addition, it reduces muscle fatigue by improving glycogen stores (Karakuş, 2014).

Carnitine; It is usually found in skeletal and cardiac muscles in our body. Meat, fish, chicken and some dairy products can be mentioned as sources of carnitine (Kerksick et al., 2018). This amino acid plays an important role in muscle-energy metabolism by oxidation of fatty acid and increasing energy consumption. There are claims that it is effective in increasing endurance performance (Karakuş, 2014).

Protein powders; amino acids are the building blocks of our proteins. It is also involved in the structure of enzymes, hormones and hemoglobin in the cell. Athletes take protein supplements to increase their existing muscle mass, prevent protein breakdown, increase muscle glycogen synthesis and increase athletic performance (Kerksick et al., 2018).

8. Doping

It is stated in the sources that elite level athletes use stimulants to increase their performance in sportive games and competitions that contain the competitive factor since ancient times (Finley & Pleket, 1976; Lippi et al., 2008). As time progresses, and thanks to the technological opportunities that today's dominate, significant advances and developments have been made in the field of biotechnology. With these developments, it has been observed that there are attempts to open the areas of use of synthetic molecules and recombined hormones and to have an effect on the genes of athletes (Pokrywka et al., 2013).

One of the oldest use of doping, which is also known in the past and today, is the use of dried fig diet by Charms of Sparta to increase running performance in the Olympic Games held in 668 BC. It is also known that in ancient times, the Greeks used some stimulants in sports training and the Romans used herbal stimulants that are good for fatigue and injury (Voy et al., 1991). With the 19th century, an increase was observed in the number of drugs whose usage areas became widespread. The anabolic effects of the detected substances as hormonal stimulants were discovered and started to be used as muscle builder and restorative. Anabolic effects began to be obtained with the synthesis of the testosterone hormone, which was also in

isolation at the beginning of the 20th century. When these substances, which were first tested on race horses, started to show positive effects, people started to try them for themselves (Kearns et al., 1942).

The use of amphetamines, a synthetic stimulant, began to appear in the mid-1930s. The first recorded death with the use of doping occurred in a cyclist at an Olympic game held in Rome. The doping used during the competition caused the competitor to fall unconscious and lose her life. As time progressed, its use became widespread in national and international organizations. (Laties & Weiss, 1981).

Detection of doping in the participants of the Tour de France, which is a very important organization at the international level, resulted in disappointment from many viewers and followers. It was determined that this is a situation that needs to be taken and WADA (World Anti-Doping Agency) was established in 1999 (Christiansen, 2005). Despite this establishment and supervision, its use in various organizations is inevitable, and penalties and sanctions have also been applied within the framework of international law. Since the middle of the 20th century, many deaths and damages have occurred during performances with the use of these substances. It is known as a problem that threatens sports and the health of the athlete (Houlihan, 2002).

9. Athlete Health and Sports Injuries

9.1. Athlete Heart and Sudden Deaths

In general, it is known that sports and exercise play an important role in people's quality of life and health. However, sports-related illness or death is likely to occur in sudden forms. Athletes in society are generally seen as people with superior physical equipment. Sudden deaths that occur because of this also bring negative feelings towards sports in the society in general (Maron et al., 1996). Sudden deaths in athletes are generally caused by the cardiovascular system. Cardiac deaths that occur suddenly may sometimes not give any symptoms until the moment of death (Maron et al., 1996).

In any sports branch, it is essential to make health screening and evaluations before participating in sports to prevent such deaths. Studies have shown that athletes with cardiovascular disease risk have a higher risk of death compared to those who do not (Maron et al., 1998).

9.2. Athlete Injuries

Sports injury can be expressed as temporary or permanent damage that occurs when a part or the whole body is overloaded and forced more than normal during sportive activity. Sports injury can be something that every athlete and participant will encounter at every level, from amateur to professional, to competitions in recreational activities (Kalyon, 1990). Recently, increasing interest in participation in sports, intensification of the work done, increase in the possibilities of sportive fields and partially unconscious performance of sportive activities are important factors that increase sports injuries. Injuries occur more frequently in contact, high-speed and high-altitude athletes compared to other sports (Polat et al., 2010).

Factors that cause athlete injuries in general; physical and mental fitness for sports, technical inadequacy, incomplete applications in warm-up procedures, equipment used, planning and

implementation of training, gender, age and other physical factors, and the duration and scope of the exercise and activity.

Sports injuries can be examined under two headings; primary and secondary injuries. Primary injuries are injuries to which athletes are directly exposed to physical pressure and stress. Secondary injury, on the other hand, is the recurrence of an injury that has previously occurred in a region for any reason (Can, 2004). Additional common and affected areas in sports injuries; musculoskeletal trauma, bursitis, joint injuries, tennis elbow, strain and sprain, golfer's elbow and muscle tears (Griffith, 2000).

In order to prevent sports injuries and injuries, athletes must undergo regular medical and rehabilitative controls. The aim here is to predetermine the mechanisms of injury and disability, to apply treatment procedures, and to make early treatment of previous disabilities and injuries suitable for return. Children who have some sportive abilities and are suitable for sportive characteristics are exposed to loads more than normal at very early times and generally continue their studies without a medical evaluation. (Griffith, 2000).

Studies on this subject show that some sports and different physiological needs cause bigger problems and injuries during adolescence. Therefore, the classification of children according to age and other characteristics and their physiological and psychological development should be taken into account when directing them to sports (Stanitski, 1993).

10. Types of Sports Injuries

In a study conducted with the participation of 1560 athletes, cases that applied to the clinic for 5 years due to disability and complaints were examined. It has been reported that 22% of the injuries are contusion and 20% are fractures. Regionally, the most common disability area was the groin, leg, knee and ankle with 60%. The most common problem was determined as overuse injuries (Önçağ et al., 1988).

As a result of injuries, the sports lives of the athletes are disrupted and their training programs are disrupted. In many of the injuries that occur, the athletes can stay away from sports for a lifetime or become an obstacle. Most of the injuries and injuries that occur during competition and sportive events are soft tissue injuries. In this context, simple skin wounds and skin damage requiring surgery can also occur (Bayraktar & Kurtoğlu, 2004). The most common condition in sports injuries is soft tissue injury. These injuries generally occur in muscle, tendon and ligament tissues.

The sports branches where soft tissue injuries are frequently seen and reported are basketball and volleyball. If classification is made in soft tissue injury; contusion, hematoma, open wounds, cramps, tendopathies, tendon ruptures, muscle injuries and bursitis (Bağrıçak & Açak, 1998).

In addition to soft tissue injuries, injuries to the joint and bone tissues also occur. Weakness of the muscles, lack of strength in the tendon and weakness in the connective tissue can be mentioned among the factors of joint injuries. Joint injuries occur due to sudden severe strain of muscles and tendons or long-term use. Types of joint injuries; sprain, strain, dislocation, injury and hemarthrosis (Kayserilioğlu, 2006). Injuries in the bone tissue are caused by micro

and macro traumas, deterioration of bone integrity and deterioration of bone functions. The deterioration of the integrity of this tissue is defined as a fracture (Hlobil & Mechelen, 1990).

11. Treatment of Sports Injuries

Early and accurate diagnosis of sports injuries makes a significant contribution to facilitating treatment and returning the athlete to sports. First, biomechanical and postural structures should be analyzed and deficiencies or traumas should be determined beforehand. For an unused region, the decrease in performance should be prevented at the maximum level by operating the other region (Bayraktar & Yücesir, 2009). Treatment in sports injuries is examined in 3 steps; preventive medicine is curative and rehabilitative. At the time of the injury, it is necessary to intervene in 4 main sections. These; first aid, preliminary treatment (rest, cold application, compression, elevation, immobilization), definitive treatment – physical therapy (massage therapy, cold therapy, hot therapy, bandaging) rehabilitation (Bayraktar & Yücesir, 2009).

12. Conclusion

To summarize, it is important for the athletes to participate in sports in a controlled and conscious way, from early ages to advanced ages, both in amateur and professional sports, at the point of protecting their health. In this regard, it can be concluded that more effective work of all national and international institutions and organizations can lead to positive developments on behalf of individuals, clubs and countries.

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NUTRITIONAL ERGOGENIC AIDS FOR TEAM SPORTS

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1. Introduction

Nutritional ergogenic aids could increase energy availability and/or quicken recover (chronically or acutely), thus enhancing sportive performance. Even still, a lot of athletes regularly use these ergogenic aids without any supporting research (Marocolo et al., 2018). The widespread usage of dietary ergogenic aids to improve performance is strong evidence that athletes are unaware of the necessary nutritional standards (Keat et al., 2017). In order to demonstrate the usefulness of ergogenic aids promising to improve team sports performance, this part focused on presenting scientific evidence from well-controlled research studies while highlighting the biochemical mechanisms and using.

2. Team Sports

People all around the world participate in team sports, which are becoming more and more popular (Bishop, 2010). Athletes in team sports frequently have to put out maximal or almost maximal efforts (such as sprints at full speed for less than 10 seconds) over a prolonged period of time (1–4 hours) (Spencer et al., 2005). Performers must also execute explosive jumps or velocity and acceleration in numerous team sports. Power, speed and strength as well as the capacity for repetitive and intermittent sprinting, are physical factors that affect team athletic performance (Wisløff et al., 2004). Especially in the context of strength and power for both jump and sprint performance, nutritional supplements that can boost the gains brought about by strength training may also contribute to improve crucial elements of team sport performance. On the other hand, team sport performance could be enhanced by nutritional supplements that hasten an athlete's recover after a game or workout (Bishop, 2010).

3. Nutritional Ergogenic Aids

Ergogenic aids are methods, substances, tools or phenomenon that create work and are thought to improve performance in relation to sports science (Arriel et al., 2018).

A component in the diet that is used to increase or accelerate exercise capacity during exercise, sport, or other physical activity is known as a dietary ergogenic aid. For instance, foods that have been enhanced with additives like caffeine or creatine are well-liked nutritional ergogenic aids (Bala & Bhalla, 2022). Sportive supplements can be used in necessary conditions for team sports. These supplements to be examined in this section are listed in the Table 1.

Table 1. Nutritional Ergogenic Aids for Team Sports Athletes

Supplements	Mechanism of Action (Possible)	Effects
Caffeine	<ul style="list-style-type: none"> Blockages of adenosine receptors (Fredholm et al., 1999) Enhances Na⁺/K⁺ATPase activity (Lindinger et al,1993) Elevates plasma catecholamine concentration (Sinclair&Geiger,2000) 	In long-term exercises by reducing the perception of fatigue and thus it can improve performance (Sinclair & Geiger,2000)
Creatine	<ul style="list-style-type: none"> Raises the muscle's overall and PCr levels (McKenna et al., 1999) 	Maintaining energy stores and increasing power (Vandenberghe et al., 1997)
Sodium Bicarbonat (NaHCO ₃)	<ul style="list-style-type: none"> Boosts the outflow of H⁺ from the muscle into the circulation Improves extracellular buffer capacity (Mainwood & Worsley-Brown,1975) Decreases metabolic acidosis (Trexler et al., 2015). 	During periods of intense exercise, it keeps the pH levels of the muscles somewhat close to normal (Mainwood & Worsley-Brown,1975)
B-Hydroxy-B-Methylbutyrate (HMB)	<ul style="list-style-type: none"> Metabolite of leucine; anticatabolic enhances recovery by stimulating protein synthesis (Mahan & Raymond, 2017). 	Supports in skeletal muscle function of contractility (Pinheiro et al., 2019)
Beta-Alanine	<ul style="list-style-type: none"> Increases carnosine content in muscle (Trexler et al., 2015). 	It decreases neuromuscular fatigue and keeps the pH levels during intense exercise Trexler et al., 2015).
Bovine Colostrum	<ul style="list-style-type: none"> Increases in skeletal muscle protein production (Bishop, 2010) 	It triggers muscle protein synthesis (Bishop, 2010)

4. Caffeine

A most widely used supplement in the world is caffeine (1,3,7-trimethylxanthine), which can be found in chocolate, tea, various energy drinks, cola and coffee.

Plasma caffeine concentration significantly connect with the way that caffeine affects the body as a whole (Sinclair & Geiger, 2000). Several studies conducted recently on animals have offered proof that caffeine may have CNS effects.

Additionally, it has been claimed time and time again that raised plasma epinephrine, which theoretically may function via the CNS or on peripheral tissues, may function as an indirect mediator of caffeine's effects (Lindinger et al., 1993; Graham, 2001; Davis et al., 2003). In a review investigating the effect of caffeine on sportive performance, it was stated that caffeine administration at levels of 4-6 mg/kg on repeated or single sprint activities (demanding high-intensity exercise) has been observed to considerably improve athletes' performances (Buzdagli et al., 2021).

5. Creatine

Creatine supplementation increases creatine phosphate content in muscle and improves ATP regeneration rate for the phosphogen system. Given that athletes participating in team sports frequently must complete many sprints, it is plausible that taking Cr supplements will enhance various aspects of team athletic performance (Spencer et al., 2004). According to a meta-analysis study examining the effect of creatine, creatine supplementation can enhance increases in power output, fat-free mass and muscle force when taken in conjunction with training (Branch, 2003). Protocol for creatine use: 2-5 g/day for 4-5 days and a total of 20-30 g of creatine use daily. Acute weight due to ~1 g acute fluid accumulation with creatine loading gains may occur (Eskici, 2015).

6. Sodium Bicarbonat (NaHCO₃)

Sodium bicarbonate was identified in the 2018 International Olympic Committee (IOC) conference paper as a supplement having strong support for its benefits for athletic performance (Maughan et al., 2018). By raising blood bicarbonate levels, a buffer that can aid to maintain extracellular and intracellular pH, sodium bicarbonate has ergogenic effects (Grgic et al., 2020).

The bicarbonate system works to prevent alterations in H⁺ ions if a strong acid (lactate) or base is administered. It is found in both intracellular and extracellular fluids. H⁺ ion is freed by the stronger acid and turns into carbonic acid (H₂CO₃) when a strong acid is added to the intracellular fluids. This supplement, which creates a buffering effect, comes to the fore in the prevention of fatigue (Matson & Tran, 1993). The literature indicates that 0.2–0.3 g/kg of NaHCO₃ administered 60–120 minutes before training would be the ideal intake strategy (Bishop, 2010).

7. B-Hydroxy-b-Methylbutyrate (HMB)

Avocado, catfish, cauliflower, asparagus and grapefruit are just a few examples of foods that naturally contain the bioactive chemical b-Hydroxy-b-methylbutyrate (HMB), a metabolite of the important branched-chain amino acid leucine (Tatara et al., 2012). In a review study it was stated that, HMB had a variety of effects on protein metabolism (Szcześniak et al., 2015). Additionally, the anti-catabolic effect of HMB on skeletal muscle is one of the main benefits of using it as a sportive supplement (Holeček, 2017). Totally, it was stated that, the molecular and metabolic actions of HMB intake are linked to an enhancement in skeletal muscle contractility. These outcomes are advantageous for athletes participating in team sports who are undergoing

resistance training and catabolic conditions (Pinheiro et al., 2019). Manufacturers frequently advise consuming 3 g of HMB daily to preserve or enhance muscle strength and function (Holeček, 2017).

8. Beta-Alanine

The amino acids l-histidine and beta-alanine are used in the skeletal muscle to make carnosine. The availability of beta-alanine is what restricts the production of carnosine (Artioli et al., 2010). A quasi amino acid called beta-alanine is derived from natural sources in the liver and can also be obtained by eating meat and chicken. Via production of intramuscular carnosine, beta alanine supplementatiton which leads to the overall buffering capacity of skeletal muscle cells, and it works as a rate-limiting precursor rather than acting as a buffers on its own (Trexler et al., 2015). Studies show that for individuals whose goals are to increase muscle hypertrophy, supplementation with beta-alanine may provide additional benefits in high-intensity training and may have positive effects on reducing body fat by delaying fatigue during high-intensity exercise (Stecker et al., 2019).

Ergogenic effect is seen when used in 4 divided doses per day (up to 6-7g per day), up to 65mg/kg daily (Bellinger, 2014). Additionally, the most consistently cited adverse reaction to beta-alanine consumption is paresthesia, which typically happens after consuming a bolus dose of 800 mg or more (Helms et al., 2014).

9. Bovine Colostrum

Bovine colostrum, also known as "early milk," is the first milk that cows make and is typically acquired during the first 48 hours after giving birth.

It is a rich source of nourishment, including both regards of macronutrients and micronutrients, just like "typical" milk (Playford & Weiser, 2021). Variety of studies state that, it most likely plays a role in the beneficial effects on skeletal muscle protein synthesis that colostrum has been shown to have (Burrin et al., 1995; Buckley et al., 2002; Hofman et al., 2002; Shing et al., 2006). There may be some data indicating bovine colostrum administration may support training-induced gains in sprint, jump, and endurance performance; however, further study is required, particularly on team sport athletes and employing team sport appropriate tests. In addition, supplementing with bovine colostrum has not been linked to any negative effects, according to the research (Bishop, 2010).

10. Conclusion

Consequently, there is solid proof that consuming NaHCO₃, caffeine and creatine supplementation can enhance multiple-sprint ability (Bishop, 2010). Among these supplements, creatine which is thought to be the most effective by contributing to the development of creatine-phosphate system and anaerobic power for team sports. According to acute (Cox et al., 2002; Ahmun et al., 2005) and chronic (Claudino et al., 2014) creatine loading studies, it is indicated that creatine contributes to the improvement of sportive performance in team sports athletes. The advantages of b-alanine or colostrum for improving performance are not as well supported by the evidence, although more study employing team sport-specific performance testing is necessary (Bishop, 2010). Nutritional or sportive supplements may contribute to sportive performance. However, the right supplement should be taken at the right time and in

the right amount in accordance with the sports branch. Professional support should be sought in this regard, and the guides of authority institutions should be followed (Kolukısa & Eyipınar, 2020).

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ARCHERY IN TURKS

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1. Introduction

The use of bow and arrow has been one of the indispensable weapons for all civilizations for about 4000 years. Nomadic communities, carrying archery on horseback, fought for dominance in the Asian steppes, and they dominated the settled communities and their armies with weak maneuver power. This much; they were indebted to their strong, agile, agile horses and their warriors, who showed great dexterity on them and could easily use all kinds of weapons. The Turkish warriors, who could shoot arrows in all four directions while galloping their horses, were very good riders. “The Turks have made the bow and arrow an effective weapon of war and have made the best use of it for their own combat tactics. By using the bow as an effective combat tool on a rapidly running horse, they developed the distance warfare method as an innovation in the combat tactics system” (Kafesoğlu, 1992).

Compound bows, which were seen as the best application of the period in all aspects, were very suitable for use on horseback. These compound bows, which had composite properties in contrast to the monolithic bows of other civilizations, were small but with a very high traction power. Undoubtedly, they also mechanically guided the emergence of "ballistas", under which the idea of throwing spears further away prevails. These hunting weapons, which are called staves, spears, and javelins in the literature, are known as the oldest among thrown materials. In this sense, the transition from thrown thrown to tension thrown has led to the emergence of a new war tactic and technology. This compound springs with composite properties; Due to its aerodynamic structure, it provides the opportunity to shoot with a strong tension. This strong tension makes it possible to pierce leather armor and, moreover, metal armor of that period. It is also worth mentioning the tirkeş (war arrows) metal-tipped arrows used to pierce armor in such powerful bows. Arrows whose structural features change according to their intended use; The spiritual power of the state loaded on these arrows, as the tool of the blood to reach the sky, has spiritual, spiritual, sportive and, of course, duties on war.

Besides all these; “We see that the term –ok- is used instead of clan when talking about the Turkish military and clan organization in Orhon monuments” (Öngel, 2001a). It seems that the Turks; “Beyond being a war tool, they adopted these weapons as an important spiritual cultural element and used them as political and legal symbols by forming some conventions around these weapons” (Göksu, 2018). All these missions have made it the most important and most powerful weapon of the steppe.

The bow and arrow was an important weapon for most civilizations. Civilizations have shaped this weapon according to the place and purpose they use. They have been designed in different sizes for different purposes such as using on horseback, using on foot or using from the castle walls. “Turkish bows are the shortest among Arab, Iranian, Crimean-Tatar, Indian and Sindh, Korean, Japanese and Chinese bows” (Göksu, 2018). The steppe communities in the north preferred to use the bow and arrow on horseback. This must be the biggest feature that distinguishes the Turkish bow from the bows of other civilizations. Because Turkish bows were

suitable for use on horses. For this reason, they could easily shoot by turning to the right or left on the horse, and even while escaping from the enemy, they could shoot arrows by turning back. In this sense, the ability to dominate the horse after it has been domesticated and to shoot the target by pulling a bow on it has enabled them to be superior to the surrounding civilizations.

The use of bows and arrows has not lost its importance hundreds of years after gunpowder was invented. The bow and arrow has been the symbol of domination for centuries on the stage of history. Although the use of gunpowder in firearms dates back to 1500 years, more time was needed to facilitate the use of guns. It was not easy for one person to carry and fire the first gunpowder rifles. The gun took time to set up, load and fire, and clean and reload for the next shot. From this perspective, it was not yet an economic weapon. While these weapons were ready for firing in about three minutes, an archer could shoot more than 30 accurate arrows in the same time. Moreover, the range of these weapons was also quite short at first. "One arrow; 10 dirhams (32 grams) at most, a hundred arrows weighing just over three kilos. An archer must carry at least a hundred arrows on his quiver when going into battle. Even so, it can be said that it is more economical than gunpowder guns" (Tuzcuoğulları, 2020a). Although there are no records from that period, we know that the violinists who used the Ottoman compound bows with the same characteristics could not open a register and get a grip in the archers lodge without throwing 900 trips (594 meters). Moreover, Tozkoparan İskender has a record of 845 meters in range archery.

The most effective weapon used in the wars between the British and the French, also known as the century wars, was the Longbow (long bow). They are known as the weapons that won the war in the battle of Edincourt. "The British longbow had a draw weight of 80 to 150 pounds, which had an effective range of up to 350 yards" (Hemming, 2022). This comes to a distance of 320 meters. The range shooting of the Turkish violinists and, of course, the range reached by Tozkoparan deserves praise.

In this sense, the "Archer Lodge" should also be mentioned. After conquering Istanbul, Fatih allocated an area for the training of archers. This area was originally Fatih's; "It is the square where he established his tent during the conquest of Istanbul (Hero, 1995, p.41). "Fatih's son II. Bayezid developed archery and established a full-fledged lodge in this area, and it was called the Okçular Lodge (Erkal, 1983; Fişek 1985; Köseoğlu, 1952; Yönel and Türkmen, 2017). Arrow fields were not only limited to Istanbul, there were arrow fields in many Ottoman provinces. The most famous of them are those in Bursa and Amasya.

Archery in Turks; It is a very comprehensive subject that covers the geography extending from Central Asia, the first settlement of the Turks, to Anatolia. In this study, attention was drawn to the value, structure and purpose of use of arrows and bows in Turks, and general information on archery in Turkish geography was mentioned periodically.

2. Symbolic and Spiritual Value of Arrows and Bows in Turks

In the Turkish state tradition, the bow and arrow had not only a symbolic value, but also an important place in the establishment and administration of the state. In this sense, let's remember the words of Oğuz Kağan: "My sons, let the bow be yours, throw the arrows into the sky like the bow" to the first ones (Day, Moon, Star) representing the domination, and - O my little sons, let the arrows be yours, the bow shot the arrow and you too. The fact that he gave

the arrow representing the subjection to the Second (Sky, Mountain, Sea) in the form of "Be like" was interpreted to mean that the Üçoks were subject to the Bozoks". (Kafesoğlu, 1992; Güven, 1999; Yücel, 1999; İmamoğlu et al. 1999; Aktepe, 2012; Küçük, 2018). It is seen that how many of the tribes come together - the arrow - takes that number in front of it. In this sense -arrow- is used in the sense of height. "Arrow and bow together -created in the sky like God- was the symbol of the khan, and he always had to dominate the peoples who used the bow, and with this symbol, he had to rule them in a traditional environment in a full and just way" (Öngel, 2001a). The homeland is established with the arrow in the family and is kept alive with the arrow. This understanding is supported by the fact that the married couples shoot arrows and build their homes and homes where the arrow fell. Again, swearing on the bow and arrow shows the sacredness of the bow and arrow. A Chinese traveler named Son-Wen used the following expressions for a sports festival held in Kivishka; "...whoever shoots an arrow at a small target placed on an atlas cloth, is declared the khan of that country for one day and temporarily gains all the rights of a khan for that day" (Tayga, 1990).

"In a document from the Crusades, the following is explained: - Each of the Turkish tribes brought an arrow to choose their chief, that is, their khan, and they chose the most noble among a hundred people. One hundred arrows gathered together in a tie. It is stated that they have agreed among themselves that a child will shoot one of these arrows and the chief will be chosen from the tribe whose name is written on the arrow" (Roux, 2001). The quiver (tirkeş) on which a bundle of arrows is placed is an important figure for the Northern Turkish-Mongolian communities. It suggests that there is a connection between the collecting power of the quiver, that is, the power to bring the tribes together, and being a state.

Festivities and festivals held in the fall are the most popular holidays. These festivals and celebrations coincide when the horses are at their strongest. Again, the Rite of the Sky is held in this period, where the most skillful archers compete with musical accompaniment. "The khan, who is considered to be the most skilled archer and the chief competitor at the highest level, was performing his duty as a kam, which expelled evil spirits by shooting arrows in four directions" (Öngel, 2001a).

These archery races and activities were the main motifs of the ritual. In another ritual, acts of expelling evil spirits were carried out by shooting arrows and lighting fire. "Altai shamans used to tell fortunes on the plateau and make it rain" (Öngel, 2001a). Shooting arrows into the sky is also a ritual act. "It is seen that throwing arrows and shouting at the sky are mostly done in lightning weather. It is much more likely that this custom was originally made instead of sending a message and a messenger to God" (Ögel, 1989). Since these non-periodic rites of shooting arrows into the sky are most likely performed irregularly, it may have a healing and purification quality. According to another view, there is a connection between shooting arrows into the sky and the tree of life. "They were shooting straight arrows at the universal tree with the belief of aiming at the sky" (Roux, 2001).

Side panels is an important figure associated with the belief system of shooting arrows into the sky in nomadic communities. The Turks; "They also associated the bow with the sky and believed that the bow was a symbol of the sky and the dome of the sky. Similarly, the Kyrgyz thought that the bow was held by the sunlight" (Berкли, 2007). "Shamans and khans held archery rites to make it rain, to reduce floods, and to keep enemies out of their pastures" (Selby, 1997;

Öngel, 2001b). Eagle feathers were used in the vest section of the arrows. “Because the eagle had a religious value due to its origin with shamans, it also had symbolic meanings” (Öngel, 2001b). Esin, 2001).

“Again, when the Chinese annals are examined, the “Ku” bow and the “curved” arrow were the ruler of the skies, “Tien”, that is, “as well as the sky god, it was the symbol of the power and sovereignty of the khan and khanate who had the sovereignty on earth” (Öngel, 2001b). Again, according to an old tradition, sacrifice and sacrificing in Turks contain very different behaviors. “Prof. Erkes; It indicates that horses and cattle sacrificed to the sky, earth and ancestors are not cut with a knife like other sacrificial animals, but are shot with arrows” (Öngel, 2001a). Much later, in the Ottoman period, we see that there were traditions such as drowning the descendants of the sultan with bow strings and not spilling blood. In addition, although the rituals of archery shooting are more common among the nomads, it should be considered natural that in the great Turkish geography, each Turkish tribes show different behaviors related to this ritual from time to time.

3. Structure of Springs

Works on the structure of Turkish traditional bows; Although it has a literature mainly from the Ottoman period, it is possible to find its traces in older Altai epics and tales. As described in Radlof's Altai tales called Kara Atlı Han (Martay Kara), "bow making is an important work and art among Turks. For this in the tale, the child falls into the mountains and catches seven deer goats and prepares the bow from their horns. The Turkish bow, which consists of horns, wood and nerves, was made by sticking them with fish glue” (Ögel, 1989). As described in the tale, the main materials used to create the Turkish bow are wood, horn, tendon fibers and the glue for bonding them. “Forty-three dirhams are taken from each of these four substances and they are prepared; dried; cleared; it opens into a ring; is put into grooming” (İrtem, 1939). Since one dirham is 2.97 grams, 43 dirhams equals approximately 128 grams. Unlike what is described in the tale, bringing these materials together and assembling them step by step was a delicate task, but it took months of time. The stronger the spring was to be manufactured, the longer it was necessary. “Şüca of Bursa has thrown the range of Yıldız at a weight of one hundred and seven dirhams in Istanbul, and İskender who has beaten the range of Edirne with a weight of one hundred and thirty dirhams” (İrtem, 1939). This shows that they used approximately 348 and 416 grams of bow.

Wood, which is one of the most basic materials in bow construction, is important in terms of not spoiling the bow quickly. There are such springs that they have been able to maintain their order for 200 years without breaking down. Maple is known as the most suitable tree for bow making. It is said that "the best bows are made from the maple tree grown in the town of Gerece" (İrtem, 1939). Because maple glue absorbs better than other woods. It is preferable that the tree is young. The tree that comes to the thickness of the wrist; It is cut from the knotless, unscathed area, half a cubit from the ground, that is, 30-35 centimeters above. After this stage, although today's practices are very different from each other, İrtem (1939) explains the processing of wood as follows: “Draft trees are placed in a cauldron, filled with cold water and left for three days; then this water is boiled in the fire until the trees become soft; The trees are removed and the sides that come to the bone are caught in the flame of sawdust.” Afterwards, each master is

left to rest on the condition that it is different, and the longer this period is, the better the bow will be from the tree.

Another material used in the bow is the horn. The horn is the material that adds a composite feature to the pedestrian and prevents the tree from breaking. The horns are thoroughly boiled and cleaned by pouring, or they are left suspended in dry air for about a year, waiting to fall out. Some cognacs also write that they should be buried under the ground and kept waiting. The important thing in these methods is to ensure that the horn does not lose its feature. The horns should be cut towards the bent side and the same side of both horns should be used. Otherwise, one side of the spring will remain hard or soft compared to the other side. This will disrupt the balance of the spring and the proportionality of the traction power. The cut horns are boiled in a cauldron until they become soft. When it is removed from the water, it is heated in the flame of shavings or pine wood; slowly corrected. It is laid in wooden molds narrow enough for the bone to fit in and compressed; until it cools down” (İrtem, 1939). In this way, the horns are made ready.

The third material that brings the spring into the body is the nerve, that is, the tendon. The tendon is found in the area from the hind feet of cattle, from the ankle to the next joint. This tendon is the longest tendon in the animal and is the most acceptable. After the tendon is thoroughly cleaned, it is dried and stored. When it is to be used, it is beaten with a wooden mallet and the fibers are opened by making it into a wire. It is applied to the part of the spring that will come out when stretched, using different amounts according to each master. It is necessary to stick a few rounds of tendons according to the weight of the bow, which is a masterwork and is not written in the sources.

The fourth material that keeps all these parts together is glue. We know from Radlof's work that fish glue was used. Much later written sources mention that "Çega Glue" produced in the Çega Village of Gelibolu was used during the Ottoman period, but that the organic fish glue was more effective. "Preparing the fish glue required patience and dexterity. It was made from the palate skin or air sac of the sturgeon cod, which lives in the places where the Danube, Dnieper and Volga rivers flow into the sea, with many varieties" (Göksu, 2018). The presence of different information in the literature should not be seen as inconsistent. Because each master embroiders his own style and experience on the pedestrian. Of course, all of them are trying to make the best and strongest bows. Because the springs are named after that master. "Especially range bows and bows that shoot darts have high traction. If we think that the density or content of the glue used by each master may be different, that the tendon fibers can be used in different amounts for each pound, and that all this is a skill of mastery, it should be natural that this information is not included in the sources" (Tuzcuoğulları, 2020b).

4. Bow Making

The preparation of the above-mentioned materials involves a long process. Now we will talk about how these materials are put together. Turkish traditional compound bow; It consists of five separate sections where three different materials are brought together. In general, all parts of the bow, except for the head, consist of these three materials: "tree, tendon and horn". Broadcasting; It consists of five parts consisting of the handle and raft sections on both sides, the head or end parts attached to the raft heads. These parts are added to each other as masculine

and feminine. When creating the arc parts, care should be taken to reassemble the single piece of wood from the places where it was divided. When the bow is set, the flat plated horn must be affixed to the inside and along the raft. In order to increase the bonding surface of the horn and wood, grooves must be made in both materials and these grooves must be adhered to each other while bonding. Gluing with this grooving method is an important process so that the tree does not leave horns.

When the spring is installed, the tendon is attached to the outer side and the part that runs along the raft. As for how the tendon is prepared, it was mentioned above. These tendons, which are made into fibers, are adhered to the raft with glue, provided that they are of the same weight. After one layer is adhered, it is slightly bent inwards, tied and left to dry for three months. This process is repeated according to the strength and desire of the warrior who will use the bow. A rest period of about three months is required between each coat. During this period, the spring is tied by the tendon by bending a little more each time and kept suspended in a moisture-free, dry environment. This process is repeated every three months, depending on the desired pound. Finally, the spring is kept in a suitable environment for a year and then, if desired, it is strengthened by wrapping it with leather, thus it is protected against external factors. This process is a precaution so that the spring does not deteriorate in rainy weather and its parts are not thrown out.

5. Aerodynamic Structure of Springs

Although the bows have been carried to the present day in a customary structure since the Old Turks, we see from the sources that they diversified during the Ottoman period. When we take Süleyman Kani İrtem's "Turkish Kemankeş" as a reference, we can talk about three types of bows as "Peşrev, Haki and Puta". Some sources also mention "Darp, Tirkeş, Çaka" bows, which are actually Puta (i.e. war) bows classified by İrtem.

The most important feature of Turkish bows is that they are reverse twisted. The tension created by the reverse twist creates a tremendous energy and allows a powerful flight by pushing this arrow. "When the bow string is stretched, the muscle energy of the archer is stored as potential energy in the bent bow, and when the bow string is released, the stored energy turns into the kinetic energy of the arrow" (Bir et al, 2006). That is, the object has an energy with acceleration due to the movement it has made. "Here, the section where the energy is stored is the "safe" section. There is a structural difference between raft and safe. It is certain that the raft section is both flexible and strong. Reverse resistance in the spring between the raft section and the casing; It is due to the fact that the raft is flexible and the casing part has a rigid body thickness, which is the part where energy accumulates and the tension reaches the highest point" (Tuzcuoğulları, 2020b). The tendon fibers remaining on the outer part of the spring now press on the contracting part, thanks to the tension, and this energy is created. The moment the beam is released, the spring acts to return to its pre-establishment form.

"The aerodynamic structure of Turkish bows, which take names such as composite, compound, reflex, was perhaps created after centuries of practice. It can be seen that the range of Turkish bows draws attention in the world as much as their structure. The range, which reached 845 meters in the Ottoman Period, attracted the attention of the whole world and prompted people to research the structure of these springs" (Tuzcuoğulları, 2020b).

6. Structure of Arrows and Making Arrows

As there are differences in bows, there are structural features that distinguish arrows from each other. Arrows differ according to their intended use. The arrows used in war and the arrows used in target shooting (puta, basket) and the arrows used in range shooting are structurally very different from each other. “Altai blacksmiths made arrowheads from high-quality iron” (Gumilov, 1999). While the range arrows are preferred light and relentless, the combat and battered arrows are metal tip and have a triangular structure. If we look at the much later (Ottoman period) sources, the arrows can be classified as: “Tirkeş, Talim, Puta, Menzil, İdman and Meşk. These arrow types are: Pişrev (Yeksüvar), Zergerdan, Karabatak, Khaki, Azmaış, Puta, İbriş, Torba Gezi (Talimhane Arrow), Air Gezi, Çarh Arrow, Beech Arrow. It is possible to call it as Accident Arrow, Slingshot Arrow, Sergeant Arrow (Buzzing arrow, whistling arrow), Mint Arrow, Fire Arrow” (Tuzcuoğulları, 2020a).

Let's explain these types of arrows according to their intended use. Pişrev; It is a very light range arrow made from reeds up to a period. Temreni are usually sharpened or made of bone. “Zergerdan; range is an arrow, it is a gold wire wrapping around the throat of the arrow, which is the insignia of its master” (Pakalın, 1972; Yönel & Türkmen, 2017; Yücel, 1971). Azmaış arrow is range arrow. It is a type of arrow used in training. Puta; bony mark arrow. “Puta and Azmaış arrows are arrows used for trial and training. The aimboard, which serves as a target in group shots, is also called Puta. This shot is called the Puta shot. This target can sometimes be baskets, bundles or eggs” (Köseoğlu, 1952). read khaki; It is another range arrow, naturally only used in long shots, the vest part is depressed arrows. read cormorant; This is also a range arrow, but cormorant feathers are used in the vest part. It takes its name from here. “İbriş; (ebruveş) range arrow. It states that it is obtained by hitting the old idol and khaki arrows with a needle vest so that the training is not stopped. Bag Travel; The work used in shooting is the arrow” (Pakalın, 1972; Yönel & Türkmen, 2017; Yücel, 1971).

“Air Excursion; This arrow, which is used in training for range shooting, has no spine or vest” (Ayanoğlu, 1974; Yönel & Türkmen, 2017). Cross Arrow; It's a war arrow. Therefore, the temreni is made of iron and its length is short like other Turkish arrows. Beech Arrow; It is made of beech wood, hence its name. Although there is no clear information about this arrow, there are differences between the temren and the vest. Sergeant Read; It is used to show targets in range shooting and wars. These arrows, which started to be used in the old Turks since the Mete Han period; Functions such as communication, frightening and guiding (directing) gave the warriors privilege. Of course, this situation facilitated communication between the warriors, and was sometimes used to psychologically influence the enemy” (Tuzcuoğulları, 2020c).

Due to the chambered construction of the temren part or the fact that it buzzed while flying in the air due to the notches opened on the temren, it was also named as buzzing arrows, whistling arrows. Fire Arrow; They are arrows used for burning vehicles in the sea. Again, they are arrows used to start a fire by throwing into the walls during castle sieges. Structurally, the stem part is marsupial. Mint Arrow; Used in battles and combat training. The spines of these arrows are made of metal. It is used in wars to pierce enemy armor made of metal. Slingshot Arrow; It is thought to have been used in hunting. The temren part is flat and sharpened by carving. It is used in fishing.

There is no clear value in the sources regarding the length of the arrows. This may be due to the fact that the springs are custom-made. According to Öngel, the length of the arrow was adjusted according to the user; “The length from the middle of the throat to the tip of the index finger is measured, and by adding a factor of safety of three or seven centimeters to this length, the ideal arrow size for an archer would be found” (Öngel, 2001b). İrtəm (1939) mentions that Bursalı Şuca uses 10 tufts and 2 finger bows, while violinist Mustafa Sergeant uses 9 tufts and 1 finger bow. He says that arrows can extend up to 8-9 handles. “Turkish arrows are the shortest (0.7 m) and light (10-18 gr) arrows known” (Bir, Kaçar and Acar, 2006).

“Arrows were made of beech-birch (it is thought that the beech tree mentioned in ancient sources was actually birch), pine wood and reed” (Tuzcuoğulları, 2020a). It is known that later it was made only from pine wood. “The ala of the pine was in Kazdağı in Bayramiç. In that vicinity, the people of Çavuşlar Village were familiar with cutting the best arrow tree from Üçler Mountain” (İrtəm, 1938). After the branches cut from the pine were turned into reeds, they were hardened by rolling them on the hot sand. Depending on the purpose of use, the temren part was either chipped and sharpened or metal tips were attached. “The ends of the war arrows are iron; The ends of the range, buta and minted arrows are made of iron, ivory or carob” (Kahraman, 1995).

“Ottoman archers generally used 6 types of temren. One variety is called flat. A triangular type is used against enemies or game animals. One type is called Zeytuni and is attached to puta and Azmaış arrows. The tip is not sharp. One of them is called Almost, the bag is attached to the travel arrows” (Kahraman, 1995; Yönel & Türkmen, 2017). When looking at the ancient arrow fragments (Istanbul Military Museum), one can see triangular or hook-shaped thorns towards the body. It is probable that these temrens belong to the arrows used in the war. It wouldn't make sense to use these arrows in hunting or sport archery. “The blades of war arrows are sharpened like knives and water is given to swords just as water is given to them and they are turned into steel” (Yönel and Türkmen, 2017). “If the steel is given too little water, the temper will bend easily, and if too much water is given, it will become brittle. Quenching recipes are the secret of the masters” (Acar, 2013).

We see that arrows were named in four parts during the Ottoman period. These are: hindsight – vest – body and temptress. Travel: It is the part of the arrow that has a triangular slot placed on the beam. "Waistcoat; It is the name given to the feathers attached to the back of the arrow so that it does not miss its target when it is thrown and does not exceed the target” (İnan, 1943). Body; The parts are named after the human body. “The body of the arrows is in the structures of Şem Endam, Tarz-ı Hasve Kiriş Endam. If we open them; Şem Endam: Its body is wide and it has a structure that tapers towards temren and gaze. It is similar in structure to wax. Style-i Has: It has a structure that tapers towards the hindquarters while the hindquarters and body are of the same thickness. Kiriş Endam: It has a structure that gets thicker from temre to Gezi” (Tuzcuoğulları, 2020a). The size of the arrow as a whole is examined in 24 parts. “From the ankle notch, the first 4 parts are called the head, the navel instead of the throat 10.5-11 parts at the end of the head, the chest between the throat and the navel, the calf from the navel to the 17th part, and the foot from the calf to the tip, that is, between 17-24 parts” (Yücel, 1971).

“Some wrestlers were very careful and finicky in the choice of arrows, they used arrows cut from the part of the tree that came into the air they would shoot at the range with whatever air

they would shoot” (İrtem, 1938). We can see the precision of wrestlers and bow masters in making bows and arrows.

In the workshops where bows and arrows are made, the existence of rules such as not cooking oily food in order not to penetrate the bows made shows the sensitivity on this issue. As a result, the Turks were a skilful nation in archery. For this reason, they were called "bowling tribes" and "archer nation" by other nations. Being able to use the most effective weapon of the period on a horse gave the Turks great advantages. Their horses were as agile as their bows. Using both of these skillfully, the Turks ruled from the Asian steppes to Eastern Europe for centuries.

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INVESTIGATION OF INSULIN MECHANISM AND EXERCISE CORRELATION

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1. Introduction

In sports studies, the human organism is faced with loads above the daily working level. There are systems that provide the coordination and order of more than one activity in the human organism. These systems appear as 1. Nervous system 2. Endocrine system (Dündar, 1995; Karbek, 1990; Tortora, 1983; Tuncel, 1994)

While the nervous system in the organism responds quickly to balancing in the cellular dimension, the endocrine system has a slower and longer balancing effect compared to the nervous system. The endocrine system is held primarily responsible for more than one physiological response and adaptation to exercise due to the regulation of functions within the cell (Brooks, Fahey, White, Baldwin, 2000). Different stress situations such as heavy training and exercise work affect the release of hormones, causing the levels of some hormones to increase or decrease in resting states. The effects of sportive studies on the release of hormones in the organism are among the important subjects researched by sport physiologists and sport physicians today (Güneş, 1995; Heipertz, 1985).

Hormones released in the organism are chemical substances that are released into body fluids by endocrine organs and are effective in target organs. The release of hormones from the endocrine glands is regulated by feedback mechanisms. In other words, when the amount of hormones secreted decreases, the release of the hormone increases, and when it increases, there is a decrease in the release (Fox, 1984).

Each hormone differs in terms of its effects and mechanisms of action, and its effects on the target cell occur through different mechanisms.

Mechanisms of action of hormones in the body;

- Activates the enzyme systems in the organism.
- Increases cell membrane permeability inside the cell.
- It allows the muscles in the body to contract or relax.
- They trigger protein synthesis in the body.
- It provides the initiation or regulation of secretory functions in cells (Powers et al. 1992).

Information about hormonal responses during exercises is very limited in the scientific world and depends on the density variability of known hormones in blood and urine in the human body. Various stress situations affect the release of hormones and while increasing the release of some hormones, they decrease the release of some hormones. However, examining the hormonal responses given during exercise by looking at the concentration of hormones in the blood, urine and tissues causes misleading results for the scientific world (Guzel, 2007). This

is due to the fact that the hormone density released in the body is affected by more than one factor.

Factors affecting the hormone density that may occur in the organism;

- Hormone production of the endocrine mechanism.
- Destruction of released hormones by enzymes in kidney, liver and different tissues.
- The amount of hormone that the tissue in the body can absorb from the blood.
- Blood volume difference in the body (Powers et al. 1992).

Nowadays, it is also important how long the hormonal effect lasts in the body, rather than the increased blood density of hormones during exercise.

While some hormones show their effect and break down in a very short time, the other part can continue its effect for hours or days. Although it is known that the increase in hormone density is caused by the production of endocrine system organs, increased hormones may not cause an increase in target tissues at the desired level.

2. Pancreatic Hormones

The pancreas is an exocrine gland that secretes enzymes into the digestive tract, and endocrine secretions are the hormones it secretes. These secreted hormones are synthesized, stored and secreted by pancreatic islets in the endocrine part of the pancreas.

Hormones synthesized from pancreatic islets are glucagon, insulin, somatostatin and pancreatic polypeptides (Braun, Horton, 2001). Of these secreted hormones, the insulin molecule consists of two amino acid chains, while glucagon consists of a single amino acid chain (Freedson, Katch, Sady, Weltman, 1979). The main task of these two hormones in the organism is to keep the blood glucose level under control (Devries, 1986; Güneş, 1995).

3. Glucagon Hormone

This hormone is perceived by the alpha cells in the islets of Langerhans and is a hyperglycemic hormone that increases the blood glucose level by stimulating the breakdown of stored glycogen in the liver into glucose (glycogenolysis), triggering the release of fatty acids and glycerol from adipose tissues and promoting the use of fat for energy (Braun, Horton, 2001; Devries, 1986; Dündar, 1995). On the other hand, glucagon hormone increases the formation of glucose from amino acids in the body (Noyan, 1993). While this hormone in the body increases with aerobic exercise, it decreases with anaerobic exercise (Gökbel and Dölek, 1998). Glucagon hormone has the effect of increasing the glucose level in the body.

During the exercises, the blood glucose level falling with the help of this hormone is balanced by increasing the release of glucose from the liver (Güneş, 1995). It is reported that the glucagon level increases with long-term exercises (Devries, 1986).

4. Insulin Hormone

The main function of the insulin hormone in the body is to reduce the glucose level in the blood by increasing the glucose entry into the tissues (Dündar, 1995; Karbek, 1990; Tuncel, 1994;

Ganong, 1995). On the other hand, it provides storage by stimulating the conversion of glucose into glycogen (glycogenesis) in the body. The hormone inulin is usually broken down in the liver, to a lesser extent, in the kidney (Guyton and Hall, 1996).

It is necessary to increase the plasma glucose level for its physiological regulation (Murray, Granner, Mayes, Radwell, 1996). Approximately 50% of insulin is supplied from the circulatory system during one pass through the liver (Kurtul, Çıl, Paçacı, 2005). A certain amount of energy is required for insulin secretion in the body.

Since glucose and free fatty acids are necessary for energy in the body, insulin concentrations decrease proportionally depending on the intensity of exercise during exercise, and glucagon concentrations increase (Guyton and Hall, 1996). During exercise, falling insulin and rising glucagon concentrations keep blood glucose constant.

During exercise, low insulin concentrations increase glucose secretion from the liver and fatty acid secretion from adipose tissue (Karbek, 1990; Devries, 1986; Guyton and Hall, 1996). Insulin hormone has an anabolic effect and provides cell growth by converting amino acids into proteins in the body (Devries, 1986; Noyan, 1993).

In addition, there is a decrease in the insulin response to a similar workload with regular long-term exercise programs, that is, the decrease in insulin during exercise. With long-term regular exercise, it increases the sensitivity of insulin receptors and achieves this effect by using lower insulin for the same effect (Guyton and Hall, 1996).

One of the most well-known effects of regular physical activities is the regulation of blood glucose. Because physical activity is a stressor that consumes glucose, which is of great importance for the cells in the body. Regular physical activity of appropriate duration and intensity reduces insulin resistance and contributes to the increase of GLUT4, known as the “muscle glucose carrier protein”, thereby increasing the glucose uptake of the muscles (Kasımay and Metin, 2009). Within 24-72 hours after physical activity, a decrease in blood glucose level and an increase in insulin secretion occur (O'gorman, Karlsson, Mcquaid, 2006; Galbo, Tobin, Van Loon, 2007). There are studies stating that the decrease in blood glucose level is related to the duration of the intensity of the exercise and that the same effects can continue for 5-7 days after the exercises (Horton, 2006; Can and Ersöz, 2003).

It has been reported in a study that there is an increase in the glucagon hormone and a decrease in the insulin hormone during long-lasting and endurance-requiring exercises (Noyan, 1993). However, on the contrary, it has been reported that there is no decrease in insulin hormone in short-term and intense exercises (Tiryaki, 1992). The increase in glucose use during exercise is directly proportional to the intensity and duration of the exercise, and accordingly, the glucose and insulin levels in the blood decrease. The decrease in blood glucose level that occurs during exercise is balanced by the increase in glucose secretion from the liver by the glucagon hormone (Güneş, 1995).

There are studies reporting an increase in glucagon levels and a decrease in insulin levels with long-term exercises (Devries, 1986). In a study, it was reported that moderate and high-intensity aerobic exercises increase insulin sensitivity and facilitate weight loss (Can and Ersöz, 2003). However, it has been reported that the changes in insulin sensitivity caused by a one-time acute exercise disappear within a few days, it has no effect on glucose regulation, and therefore, the

exercises performed to reduce insulin resistance should be regular and long-term (Koz and Ersöz, 2002). There are studies showing that fasting blood glucose can decrease within 24 hours after exercise depending on the intensity of exercise, while combined exercises provide a significant improvement in blood glucose compared to other exercises (Black, Swan and Alvar, 2010).

In a study examining the effects of aerobic exercise on leptin and insulin hormones, it is reported that aerobic exercise reduces the insulin levels of athletes (Karacabey, Yamaner, Saygin, Özmerdivenli, 2014). It has been reported in studies that endurance exercises also reduce the level of insulin hormone (Zeinali, Nodoushan, Firouzian et al. 2012). It has been reported that intense aerobic exercise performed on athletes also lowers the insulin hormone (Moghadas, Nuri, Ahmadi, 2013). It is stated that cycling exercise applied on healthy individuals also reduces insulin levels (Khoo, Wallis, Tsintzas et al. 2010).

In a study examining insulin and blood glucose values after aerobic and anaerobic exercise on nine male football players, it was found that insulin levels decreased again (Aydın, Gökdemir, Cicioğlu, 2000). Insulin levels decreased with aerobic exercise performed in individuals who lead an active life in a sporting sense (Grieco, Swain et al. 2013). After prolonged cycling exercise, there was a decrease in the level of insulin in the blood (Zoladz, Duda et al. 2002). It is a fact that has been demonstrated by studies that physical activity reduces insulin levels and increases insulin sensitivity (Bulut, Bodur, Colak, Turnagöl, 2013).

5. Insulin Resistance

Insulin resistance is called insulin resistance when more insulin is released than normal to create a quantitatively normal response (Berson & And, 1970). Insulin resistance is a condition associated with decreased response to insulin in insulin-sensitive tissues, uncontrolled insulin production in pancreatic beta cells, and decreased glucose uptake in target tissues (Ulukaya et al. 2007). Insulin resistance, which basically occurs in individuals, causes the destruction of beta cells and the presence of more insulin than normal in the blood, as well as laying the groundwork for Type-2 diabetes. Studies have reported that there is an increase in proinflammatory cytokines and a decrease in anti-inflammatory cytokines due to the increase in adipose tissue in obese individuals (Bray, et al., 2017). Insulin resistance, the incidence of which has increased in recent years, poses a risk for many diseases such as obesity (WHO, 2000).

Unhealthy diet emerging today, a sedentary lifestyle, aging, drugs used, pregnancy, genetic factors reveal obesity and insulin resistance. As a result of this situation, conditions such as diabetes, hypertension, dyslipidemia, and vascular occlusion occur. It is possible to get rid of many metabolic diseases by making changes in our lives. With proper nutrition and an active lifestyle, it is possible to get rid of these diseases that will occur by getting rid of excess weight and protecting or increasing muscle mass (Ivy, 1997; Cuff, et al., 2003). Physical activity increases insulin sensitivity in the muscles and provides an increase in glucose entry into the muscle independently of insulin (Dela, et al. 1993). An active life contributes significantly to the prevention or reduction of insulin resistance and positively affects insulin sensitivity (Thorell, et al. 1999; Henriksen, 2002).

Obese individuals have higher circulating free fatty acids than normal individuals. Therefore, the possibility of insulin resistance is higher in obese individuals (Savage et al. 2007). In many studies, it has been revealed that the presence of high amounts of fatty acids in the circulatory system causes insulin resistance (Boden, 1997; Kelley et al. 1993). The accumulation of fatty acids in obese individuals causes insulin resistance (Perseghin et al. 1999; Krssak et al. 1999).

Diabetes occurs when insulin is deficient or insufficient. It occurs in conditions such as carbohydrate, protein and fat metabolism disorders in diabetes. It is one of the most common chronic diseases in society. In addition to genetic factors, environmental factors are also effective in the increase of this disorder (Mcardle et al. 2000). The underlying cause of insulin abnormalities in diabetes is the insufficient effects of insulin on target tissues. Diabetes can cause more than one serious problem, not only on the health of individuals (Erbaş, 2015).

With the increase in population, urbanization and the increase in obesity, the number of diabetic patients is increasing day by day. In addition to many factors that cause diabetes, environmental factors, genetic factors and sedentary life also play an important role in this disease (WHO, 1999). It is the 9th biggest cause of death among the diseases found in the world. If precautions are not taken, it is estimated that more than 5 million people will have this disease by 2025 (Kuzuya et al. 2002).

Types of diabetes; It appears as Type 1 diabetes, Type 2 diabetes and gestational diabetes (Doğan, 2008). Type 1 diabetes is characterized by a decrease in insulin after the destruction of existing cells in the pancreas. On the other hand, type-1 diabetes may arise from the immune system as well as idiopathic (Feyizoğlu, 2015). Type-2 occurs when insulin resistance and insufficiency coexist. This type of diabetes usually does not have an age range, but the diagnosis of this disease is made after the age of 30. Although it is more likely to be seen in overweight or obese individuals, it can also be seen in individuals who do not have weight problems. The common symptoms of people with type 2 diabetes are an increase in appetite, a desire to go to the toilet frequently, and a constant feeling of thirst. People with these symptoms are taken under diabetes follow-up (Vandenoeveria, 2010).

Physical activity causes different metabolic and hormonal changes in the body of the person. For this reason, before applying physical activity programs for diabetic patients, necessary examinations should be made and exercise programs should be applied after that by minimizing possible problems (Loveman et al. 2008; Nagi & Gallen, 2010). Moderate-intensity aerobic exercises are recommended for patients with diabetes, not less than 150 minutes per week. For patients without complications, higher intensity exercise programs can be recommended. Thanks to regular exercises, it is possible to prevent or delay the symptoms and complications of the disease in diabetes patients (Pilkis & Claus, 1991). Individual exercise programs should be recommended or implemented in diabetes patients, not general ones (Loveman, 2008; Nagi & Gallen 2010). With the help of the exercises to be performed, it is possible to provide glycemic control as well as fat loss in the abdominal region (Loveman, 2008). There are different purposes and benefits of performing exercises in diabetic patients. The aims of the exercise; It is to reduce the insulin demand in the body, to increase the glucose uptake to the muscle tissues and to reduce the plasma blood glucose concentration by carrying the necessary glucose to the muscle fibers.

Its benefits are to reduce the high blood pressure that may occur, to provide hormonal balance in the body, to increase performance by increasing muscle strength, to increase joint mobility and to improve quality of life by increasing personal self-confidence (Artal, 1990).

Exercises are used as a treatment method in patients with Type-2 diabetes because they reduce the level of glucose in the blood. The first effect of physical activities on the body is on abnormal insulin secretion and peripheral insulin resistance. These patients have a lower functional capacity than their normal peers, but an increase in oxygenation in peripheral tissues is observed during exercise (Polat, 2016). After low and moderate-intensity physical activity, a decrease in blood glucose level occurs in patients with Type-2 diabetes and obesity. It is observed that this effect continues after physical activity (Kjaer et al. 1990).

In regular exercises in patients with type-2 diabetes; It has been determined that there are positive physiological effects on resting or submaximal heart rate and on blood pressure during exercise (Koivisto, DeFronzo, 1984). There are also studies on insulin-dependent glucose uptake, improvement in skeletal muscle and adipose tissue within 72 hours of physical activity in these patients, but this positive effect is restored within a certain period of time. For this reason, it is stated that the exercise programs applied for the treatment of patients with Type-2 diabetes require continuity (Blair, et al. 1989).

Many studies conducted today focus on the effects of physical activity on insulin sensitivity and glycemic control (Koivisto et al. 1986; Blair, Cheng & Holder, 2001). Recently, more than one drug has been produced against diseases such as diabetes, circulatory system disorders and obesity, but physical activity, nutrition and regular living habits continue to be the most effective method used in the treatment of these diseases (Chakravarthy et al. 2002).

Regular exercise to improve endurance not only increases physical performance, but also helps reduce the risk of chronic diseases in individuals. Studies have shown that the increase in muscle oxidative and glucose transport potential, which occurs with exercise, reduces the risks that may occur in patients with insulin resistance and Type-2 diabetes (BMJ, 2020).

Women who do not have diabetes and who do vigorous exercise at least once a week have been followed for 8 years and it has been determined that the risk of developing diabetes is 33% less (Manson et al. 1991).

Again, in a subject group followed for 8 years, it was determined that the most active group had 26% less diabetes than the sedentary group (Hu et al. 1999). Studies have shown that regular physical activity reduces the rate of developing diabetes by 30% (Jensen and Leighton, 2000). In a study conducted on people diagnosed with type-2 diabetes, a significant decrease was found in insulin resistance after 6-8 weeks in the exercise group, which was provided with at least 1000 steps per day (Yamanouchi et al. 1995).

The results of various studies in which aerobic studies were applied were evaluated and it was determined that there was a significant decrease in HbA1c values in the groups that exercised (Boulé et al. 2001). In addition to the decrease in the HbA1c values of the exercise group, there is also a decrease in LDL cholesterol levels (Kelley and Kelley, 2007). There are studies investigating the effect of the intensity of exercise in addition to the form of exercise in patients with diabetes. It has been reported that there is a greater difference in insulin resistance in HbA1c values in individuals who spend the same total calories but perform higher-intensity

exercise (Coker et al. 2006; O'donovan et al. 2005). Until recently, the effects of resistance exercises on chronic diseases were not included in the studies. However, recent studies have revealed that resistance exercises also affect insulin tissues and can be used to prevent the risk of diabetes formation and to treat the disease (O'hagan et al. 2013). It was found that there was a decrease in HbA1c values in individuals who underwent 12 weeks of moderate-intensity resistance exercise (Eriksson et al. 1997). It was revealed that resistance exercises performed in the randomized control group caused an increase in muscle mass, a decrease in body fat and HbA1c values (Baldi and Snowling, 2003; Castaneda et al. 2002).

In the exercise programs in which aerobic and resistance exercises are applied in combination, a significant change was found in HbA1c values compared to aerobic exercise, resistance exercise and individuals who do not exercise (Sigal, 2007).

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PIECES ACCORDING TO THE INTENDED USE IN THE OTTOMAN STATE

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1. Introduction

The older the human history, the older hunting and war must be. Protecting from predators, being able to fight or hunt them, and being protected against other enemy tribes were the basic life instincts. It required protection to survive, feeding and hunting naturally to sustain life. It is probable that the motive of protection and survival led to the emergence of the first weapon technologies. This weapon development in the primitive was directly proportional to the physical development of the first humans. If the use of all biomotor abilities was possible with the completion of the development, similarly the ability to use weapons largely depended on this development.

The first materials that could be called weapons consisted of substances found in nature. The rocks and trees must have provided enough of the initial raw material needed. “The first tools used as weapons in history were stones and sticks. Then, the first spears and axes were made by attaching the properly carved stones to the ends of the sticks” (Iyiat, 2017). While wood, rock and other plants were the first materials used, structural and chemical changes over time led to the emergence of different weapons. The impulses to resist, defend and attack show that the similarity or similarity of the weapons converted from use to use by throwing with the hand can strengthen the view that they basically belong to the same period. However, it should be kept in mind that there is a development for the motor abilities connected to the human body and that holding or throwing skills can develop according to this development.

On the other hand, the transition to firearms would take time in the Ottoman Empire as in the rest of the world. Moreover, the use of weapon technology at that time was advancing simultaneously with the west. In fact, the development of fuse-fired cannon technology, which is in the firearms group, was ahead of Europe. Because “Ottomans, from the 15th century on, rifles, 16.-17. They have used guns since the 19th century. In this process, the Ottoman Empire was the biggest state of its age. The Ottomans, who had to constantly engage in conquest movements as a state policy, attached great importance to the army and weapon power, especially for this reason and due to the military experience brought by their traditions throughout the ages” (Çoruhlu, 1993). However, it was also difficult to transport the weapon from one place to another. At first, at least two soldiers were needed to carry a rifle on the battlefield. This was not an economic situation at all. Moreover, “in early single-shot firearms, it took a long time to prepare the weapon for a second shot” (Çoruhlu, 1993). This not only endangered the lives of the soldiers, but also lagged far behind the performance of conventional weapons. Naturally, these weapons were used by more stationary soldiers. This was ideal for castle defenses for the first time. However, it would take a long time to replace Turkish arrows with good range. Archery and other traditional war tools continued to be important in the Ottoman Empire for a long time.

2. Pin and Similar Terms

The geographical location of the Ottomans also made it possible to interact with other civilizations. The transition of Arabic and Persian words to Ottoman Turkish, especially in the 1600s, increased this interaction. In this sense, the word club has settled in today's Turkish in this way after the interaction in question.

If we evaluate this short reminder; “While the word nobud is not found in Turkish dictionaries, the Arabic word that we consider to be its origin with its similarity in sound and meaning is nebbût” (Ayverdi, 2011; Özveri & Acar, 2016). It is likely that the word will transform in terms of easy expression in the Ottoman country, such as nebbüt - nübüt - nobut. Moreover, the term “pin” is also mentioned in recent sources. Until today; Rather than dwelling on the differences such as club-pin-pin, the terminology of the instrument is more important in terms of its intended use. Acar, as the dictionary meaning of the club "scepter; short, smooth and solid stick". The meaning of sport is mentioned in TDK as "gymnastic tree made of hornbeam, used to improve arm strength".

3. Pin Structural Features

Referring to the expression in Özveri and Acar dictionaries, “Before the invention of the cannon, a smooth stick with a length of 70-80 cm and a diameter of 5-6 cm, used as a weapon by throwing it over the walls by master junds in horse riding, in castle sieges, to injure those inside; training tool” (Özveri and Acar, 2016). According to this definition, no structural feature related to the tip of the pin is specified. Kahraman, on the other hand, while describing the pin in his work, says, "It is a dry oak stick with a length of 85-90 centimeters and a thickness of 4-5 centimeters" (Ata, 1291; Kahraman, 1995). He points out their structural differences by saying that "the tip of the pin is the one with a pointed and sharp iron" (Kahraman, 1995) as the feature that distinguishes the pin from each other. This recipe is actually more suitable for the analogy of a pin thrown into a castle. Because the pin must have metal pieces so that its weight is effective when it is thrown into the goal. Again, the tip should be metal and pointed so that it really does its job for this job. The pins, whose weight is on the tip and this weight side is pointed metal, can only harm those inside the goal when they fall from high into the goal. Because, as a physics rule, an object that is thrown into the air and falls to the ground falls on the heavier side. In addition, as it is described like a pen, with a quote from Ahmed Ata, "It is also called with a pen because it looks like a big pen. Apart from this feature, it is different from the javelin and it is a little short and thick” (Ata, 1291; Kahraman, 1995).

As for the purpose of use, it is rust; He describes it as a tool that is thrown "to pierce generally hard objects, to stab the horse of an escaping or distant enemy while fighting, and to knock the rider to the ground" (Hero, 1995). With similar expressions, he also explains the purpose of the use of the pin by saying, “...athlete youth and jundies used to knock down the enemy and their horses by stabbing them with pins” (Kahraman, 1995). However, according to Kahraman's statements, here it seems that pin and hustle are mixed in terms of usage. The common feature is that, apart from the fact that both are used by throwing, just as the purposes of use change according to the developing situation during the war, these changes seem natural during the drill, and it is understood that no definite distinction can be made in this respect. As a definite and decisive distinction, it will give a healthier result to discuss the structural features according

to their intended use. The club was used for different purposes in different areas, just as the mace was used.

Pin; As an instrument of war and sport, it had an important place in the Ottoman military organization. Until the use of long-range gunpowder guns to serve the purpose, pinball was one of the important actors of the war, especially in castle and city sieges.

4. Pin as a War Tool

In addition to melee tools such as sword, ax and mace, tools such as spear, club and knuckle were the weapons used in the Ottoman Military Organization at the same time. Both mounted cavalry and foot soldiers were using these weapons, and they were rehearsing outside of the war with both these weapons and their heavy imitations. Pins were lighter than maces. Because the maces were used in close combat with the aim of damaging the enemy's body or armor and eliminating the enemy. It was an effective weapon invented to pierce, crush or shatter leather or metal armor of the period. "The mace is a weapon that creates a blunt trauma effect on the target by being thrown by its handle. Their weight varies in a wide range from roughly 10 kg to 100 kg" (Acar and Özveri, 2018).

This must be the biggest feature that separates the ball and the club from each other. The maces were a tool used by both cavalry and foot soldiers. While mace, club and knuckle could be used on horses and these tools could be carried, pedestrian soldiers were not suitable for this.

It seems logical to carry a sword and mace or sword and ax as a swinging feature. However, taking a launching device into them is not considered very usual in terms of the warrior's mobility. Because when we look at its use as a sports equipment, the technique of throwing pins while on a horse will be mentioned. However, no records of the foot soldier's club practice could be found.

Pins and kicks were made of lighter material and their construction was very different from knobs. Unlike the mace, the pins could only be used once during battle and were naturally thrown away. Some of the pins were also getting more weight towards the tip, just like the balls. This gave them a stronger hit speed. But in terms of structure, they were sharper than the knobs, and there were mostly those with metal ends. Also, using it on a horse allowed it to be thrown even more powerfully. Shots on a horse are effective in close combat as well as in ranged combat. It seems that there is no exact standard in terms of weight, thickness and structure in the club, as in the mace, and probably the standards of the soldiers or masters using it created differences. It should be considered reasonable that the same archers have different sizes and weights, as in the bows of the soldiers. In the bow, just as the masters produced bows according to the traction power of the soldier, there were also these differences in the mace, club and maybe ax and its derivatives.

One reason they achieve high speed, whether pins or other throwing slams, is because they are reasonably long. "A high-speed weapon has high kinetic energy and momentum. Therefore, besides hitting the target from afar, it has the potential to cause more damage to it" (Özveri and Acar, 2016). "It is written in some dates that the horse that the Hungarian king was riding in the war of Varna (1444) was knocked down by throwing a club, and the armored king was caught by the Janissaries because of his difficulty in moving and beheaded" (Kantemir, 1979; Kahraman, 1995)

In close combat, "thanks to the high stirrup, the warrior can rise on the horse and make a more effective strike with the sword, where he uses the speed of the horse to make his move" (Tuzcuoğulları, 2021) which gives him an advantage. The same logic applies to war tools such as maces and axes. Again, in terms of throwing ranged combat techniques, the high stirrup provides some advantages. In pin throwing, the warriors first move towards the ground on the horse and then rise on the horse and shoot.

5. Pins as a Sports Equipment

Returning to the battle scene, the soldiers fighting for life and death both in face-to-face battles and castle sieges have to attack, throw, hit and smash whatever they have as a weapon of war or whatever tool they see and pick from the ground. If we think about it in this way, it was necessary to pick it up from the ground, to stick it into a pile of straw and earth at close or far distances, to be able to pull it over the determined heights by stretching a rope, and to train it at every opportunity. In short, it can be thought that such structural differences were not so important during the war. However, it is important to develop the skill of being able to throw each weapon of war if necessary. Because in a war, the first rule is to protect yourself, and the second is to eliminate the enemy you encounter.

After the reasonable use of firearms was simplified, some traditional war tools were no longer used in wars and were kept alive as sports equipment for a while. In this sense, the pin also found a place for itself as a sports equipment in the Ottoman Empire, and even continued as an important activity where the Sultans did not spare their attention and competitions were held. The game has been given a structure in which the shooting height is accepted as a success. It was already used in war, in castle sieges, by throwing it inside the castle walls. To practice this, a rope is stretched between two trees and regular repetitions are made based on pin throw. "The rider would run away from the rope and approach the middle part of the rope, bend the rear end of the labud in his right hand, and touch the ground and, taking strength from the stirrup, he would stand up and throw it into the air. It was very important to adjust the speed of the horse, the distance to be thrown and to be able to give the angle of the shot to the lab (Kahraman, 1995). Hafız Hızır, on the other hand, describes the shooting moment as "sharp bridle" while describing this technique, and describes it as "the horsemen ride their horses and stand at one point and knock their pins on the ground and toss them into the air" (Hafız Hızır, 1987). "In order to achieve this technique, the number of shots was increased every day by starting from a small number, and in this way, the highest desired record would be reached after months or even years" (Kahraman, 1995). It is clearly seen that the pin; It has become a sport where competition, spectators and, in a way, records are kept. Sultan IV. The measurement of Murad's pin throw in distance (87 meters) indicates that records regarding the record were kept.

Sultan II. Mahmut was at the head of the Ottoman Empire as the 30th sultan between 1808-1839. Although the exact date is not known, it is seen that horse running, jogging, rowing, pulling and swimming games were not included for a while during this period. ...Sultan II. When Mahmud tried to make innovations, we see that these games were abandoned" (Hafız Hızır, 1987). It is stated that the game was banned by the Sultan for a while after the injuries experienced in the horse javelin game and a game that resulted in death in some sources. It is known that later measures were taken such as cutting the javelin tip bluntly and making it from lighter trees. Today, we see it played with plastic sticks on which soft stoppers are attached. It

is stated in the sources that more importance was given to games such as archery, hammer and pin throwing in these periods.

If we go back to the time of the Sultan, it had become a tradition to perceive throwing pins as a sport and to reward the successful ones. "Sultan II. It is known that Mahmud stretched a rope between two very tall trees in the Gülhane Garden and Ağa Garden areas in Topkapı Palace, had a horse tied there with valuable harnesses to be given to the competitor who would pass his pin over the rope, and the Harem and İç Ağalar tried to pass this rope with their pins for days. (Özveri and Acar, 2016).

Equestrian technique was as important as the force to throw the lobe. In order to make a good shot, it was necessary to be a master rider first. Two different skills; Combining good riding and throwing technique requires good training. Soldiers with this coordinative ability can only catch a good throw. "Sultan IV. Murad's horse riding "from one stone to another" and throwing the nobudu when reaching the second stone shows that conventional measurement methods were applied for this throw as well" (Özveri and Acar, 2016). After this technique of the Sultan, the pin reached 87 meters. For these shots, of course, horses must have been special. "Training was not for the rider alone. His horse had to be trained as much as the rider. Just as not all horses were suitable for playing javelin, a small and agile horse trained for javelin was not suitable for cuddling and throwing pins" (Kahraman, 1995).

Sultan IV. The mentioned inscription written for Murad should also be mentioned. Although the exact shape of the thrown tool has not been defined here, the terms pin or nobud are used.

Özveri and Acar, who examined the inscription written for the shot in question; He mentions that "When you examine the inscription carefully, it will be seen that this inscription, which is referred to as a labud in some texts related to the Ottoman sports history, and which is given as "a kind of heavy, short javelin (spear)", is not actually a javelin" (Özveri and Acar, 2016). . It has been described as a tool that is not a spear, but a shorter javelin. If it is not in the javelin, which is understood from the inscription, could it be "hsht"? If we go back to the main subject; Could it be that the mounted warrior's riding the pin on the ground for a while and then rising up on the horse has the aim of developing a technical skill beyond giving an impetus to the pin?

6. Famous Pin Throwers

The ability to throw spears, javelins, arrows, slash and pins depended first of all on a good level of horsemanship. In a way, the use of all these war or sports equipment was seen as a branch of jundi in the Ottoman Empire. Since the ancient Turks, owning horses and horses was a skill developed from an early age. It's not enough for a good warrior to have a good horse, he has to be a good rider. Western historians and Islamic historians have praised a lot about this. In the Ottoman Empire, riding training started naturally at a young age. A soldier who enters the military organization grows up with the horse until he reaches that age. Therefore, he tries to master the above-mentioned war and sports equipment by taking the training required by the jundi within the military education.

The pin, which was perceived as a sporting instrument rather than a war instrument in the Ottoman Empire, was accepted as a game based on technique, horse riding and power in the palace. If we count the Ottoman pin throwers in order, definitely Sultan IV. Must say Murad. The degree that the Sultan achieved as a result of his technical skill and strength was mentioned

above. The epitaph of the monument erected on the ground, where the Sultan shot a pin, is still in the corner of the north wall of the tower in the Fourth-place inside the Topkapı Palace Museum. In front of it, there is a marble chair where Sultan Murad sits while watching sports competitions” (Kahraman, 1995). Other pin throwers recorded can be listed as follows.

II. We gave information about sports activities and especially club competitions during the Mahmud period. The fact that the sultan gave gifts to those who stole the pin over a rope stretched to a certain height shows the importance of these activities. Again in such an activity, the sultan announced that “whoever pulls a rope from the top of two high cypress trees in Gülhane Square and pulls his labud over this rope, he will give a horse worth 5000 kuruş. ... On May 20, 1817, Hasan Ağa succeeded in receiving this valuable award given by the Sultan” (Kahraman, 1995).

Again, Sultan II. Mahmud once placed a horse prize with a rope stretched around the Besiktas Palace Tiled Kiosk. “Slave İsmail Ağa got the award on October 10, 1825 by hanging his labud over the rope” (Kahraman, 1995). İsmail Ağa, a member of the Ak-ağas, is famous in sports and, of course, in jundi. Hızır İlyas praises İsmail Ağa's sexuality and sportsmanship in his work "Tarih-i Enderûn Letaif-i Enderûn".

7. Conclusion

As it is known, the common feature of some war-based horse games among Turks; It contains rules that encourage taking the weapon of war by leaning from the horse to the ground. In the mounted javelin game, picking up the javelin on the ground and attacking again earns appreciation points. In the game Kökbörü, grabbing a 30-35 kilos goat on the ground, carrying it until it wins and throwing it into the cauldron brings points.

Picking up spears, pins, axes or bats that are thrown or thrown during the war and using them again during the war can be experienced with constant repetitions. Sultan IV. It must be precisely for this reason that Murad and other pin throwers use the aforementioned technique. It is based on the idea of lowering the back of the pin from the horse so that it touches the ground, that is, hanging the body towards the ground, in a way to develop combat skills. Equestrian war sports are also important activities for the development of these skills.

Pin; The sword, ax, spear, and sometimes mace is a tool that is thrown with vertical acceleration among the tools used during the war. Their technique is different as others are launched on the horizontal axis. In order to send the pin on the vertical axis, it is necessary to complete the throw by bending down while on the horse, taking force from the ground and rising towards the horse. A warrior or athlete must be a good rider, manage his horse well, and have the technique and strength to shoot well. Therefore, at every opportunity, there were opportunities to experience them at weddings, weddings, festivals, boarding passes or palace sports areas.

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TEAM SPORTS

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1. Introduction

Team sports are defined as the occupation of a community that is created temporarily or permanently to participate in matches and competitions in any sports branch and that struggles for the same purpose with different division of labor in a team spirit (Piko et al., 2006; Şahin, 2006). Various sports branches in which there are some situations such as the fact that more than one person is fighting with an opposing team for a common goal, the ball or similar object crosses the line within a defined limit, the players in the team help each other by passing and fighting, have the feature of being team sports (Karayol, 2013). Especially in our country, it can be said that games such as football, basketball, volleyball and handball are played as team sports (Gürsoy, 2007). This section will cover the most commonly played team sports.

2. Football

Football is the world's most popular sport (Reeves et al., 1999), played in practically every nation at varying skill levels; In general, it is a sports branch in which the physical structure comes to the fore (Özer, 1993), and anaerobic and aerobic systems are activated at a high level (Akgün, 1989). Flexibility, speed, strength, muscular endurance, cardiovascular endurance, coordination, body structure and composition, which are necessary for aerobic and anaerobic efforts in football, play an important role in increasing performance (Kartal & Günay, 1994).

In order for the players to perform high-intensity movements in a quality manner, anaerobic endurance must be developed (Stone, 2009) and aerobic endurance must be developed in order to be able to repeat these movements one after the other without fatigue (recovery) at the high quality (Castanga, 2008). For this reason, performance in football depends on the capacity of the athlete to perform intense exercises repeatedly. Players need to do aerobic and anaerobic training to cope with high-intensity activities. Knowing the physiological demands in football matches is important in terms of what the expected performance from the athlete is, how it should be developed and shaping the training programs to be made (Rampinini, 2009).

In the football branch, where both aerobic and anaerobic systems are at the forefront, the main source of ATP production during a 90-minute match is seen as the aerobic system. The maximum aerobic power determined by the maximum oxygen intake may vary according to the leagues and positions played by the football players. It has been reported that the energy distribution in a football match is 98% aerobic and 2% anaerobic (Bangsbo, 1994).

In the case of physiological factors in the football game, first of all, they should be developed in the required proportions, taking into account the effective energy metabolism and motor characteristics. Then, the football-specific adaptation of these fundamentally developed features should be realized. In other words, physical and physiological training specific to football should be done (Eniseler, 1994).

3. Basketball

Basketball is a game played in two teams of 5 in a limited area, points are scored when the ball passes through the basket and the team that scores the most points wins the match (Kangalgil et al., 2014). Basketball players must be able to run, jump, accelerate, decelerate, and change direction. In other words, the power must be applied in the field as soon as possible and at the most optimal level (Cole & Panariello, 2015). In addition to being an activity where anaerobic power is at the forefront, there is also a harmony between quickness, timing and strength that reveals explosive power. Sportive skill, balance and vertical jump; It is a sport that combines speed, rhythm and timing (Orhan et al., 2008). Although the energy requirement during a basketball game is mainly met by the aerobic system, basketball activity requires a lot of anaerobic energy, which requires special qualities related to short accelerations and jumps (McInnes et al., 1995). Frequent pauses in the match allow the players to recover slightly in the game so that the players can repeat the high-intensity movements over and over (Drinkwater et al., 2008). Physical fitness parameters such as explosive power, reaction time, speed and agility in basketball are skills that contribute to the game with and without the ball. Therefore, it plays an important role in basketball technique and tactics (Erculj et al., 2010).

4. Volleyball

Volleyball is a sport played by two teams on a playing field divided by a net. The aim of the game is to send the ball over the net so that the opposing team touches the ground or makes a mistake on the playing field and prevents the opposing team from achieving the same goal. Teams are allowed to touch the ball three times when sending it to the opposing area (Falk et al., 1996).

Factors such as quick decision making, reaction, jumping and displacement are at the forefront in the game. As in other sports branches, volleyball is considered as a complex game that is affected by various factors such as physiological, technical, psychological, nutritional status and tactics (Uluöz, 2015). Volleyball is a combat sport whose technical and physical qualities differ according to the positions played by the athletes. One reason for the interest in volleyball is the constant variability in the score. The physical strength and ability to control the ball, blended with technical skills, has revealed volleyball, which is an enjoyable sport to watch (Kanbur, 2010).

The volleyball athlete must exhibit biomotor features such as strength, speed, endurance, quickness and flexibility, which are necessary for the movement patterns exhibited in volleyball sport, at sufficient levels. On the other hand, high levels of skill and coordination are needed to perform basic skills fluently and synchronously (Mavili, 2011).

5. Handball

Handball is a team game in which 2 groups of players play friendly in order to get ahead of each other by observing the game rules of handball sport (Albay et al. 2008). Like all other team games, handball is a sport that requires playing fast and observing the rules within the specified game time. For this reason, in sporting success, the athlete's main motor qualities such as speed, strength, mobility, endurance, ability and coordination, as well as technique, tactics, experience, etc. parameters are very important (Eler & Bereket, 2001).

In handball, a sport in which aerobic and anaerobic power are used together; The main elements of physical fitness can be listed as endurance, flexibility, strength and speed.

The ratio of the mentioned motor qualities in a handball player is; It can be listed as 25% speed, 15% endurance, 10% general strength, 20% special jumping and shooting power, 15% flexibility, 15% coordination level (Bilgin,1995).

Handball players must have high aerobic and anaerobic endurance capacities. Since handball is played on a small court and accompanied by a small ball, it is considered a fast team game. For this reason, it is extremely important for handball players to have high aerobic and anaerobic endurance performances in terms of match performance (Koç,2010).

In summary, team sports are sports branches where high-intensity activities and complex biomotor abilities are used together. In order to be successful in team sports, athletes need to be involved in high-sustainability plans by carefully following both their training programs and body compositions. A versatile evaluation of performance limits will contribute to success at the point of sportive performance.

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ISOKINETIC TEST SYSTEM AND ASSESSMENTS

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1. Introduction

When isokinetic tests and exercise procedures are examined, it is seen that it has been used actively for approximately 30 years. Isokinetic devices, which were developed and started to be used in the early 1960s, began to be used more widely, especially in the 1980s-1990s. Isokinetic systems enable a physician, clinician or a performance monitor to evaluate muscle performance within safe and normal values. Objective ideas about muscle performance can be produced by performing tests at different procedures and speeds. In addition to these, the balance between agonist and antagonist muscle groups can also be measured by these systems (Feiring et al., 1990).

Isokinetic exercise systems also contain useful parts of exercises with isometric and dynamic weights. Maximum load can be achieved even at joint angles where muscle power is produced at a minimum. Therefore, the level of development achieved in the muscle is at the maximum level in all aspects of joint movement. Performing the movement with the same speed and maximum tension at all joint angles reveals isokinetic contraction. In some sports branches, this contraction type and its values are widely used (Pincivero et al., 1997). The purpose of the isokinetic test systems is to keep the speed of the performance exhibited by the contraction of the muscle at a certain level. The external resistance that can be applied to the skeletal muscles on this system is at unlimited levels. Therefore, the change of the current angular velocity of the muscle power is prevented by the device by automatically creating resistance and the power produced in this way is transformed into torque (Baltzopoulos and Brodie, 1989). In training with normal dynamic weights, the resistance on the muscle generally reaches its maximum level at the end of the angles in which the joint moves. In the middle of the joint range of motion, the load on the muscle due to the position is at the lowest level. In isokinetic contraction, different from this, more importantly, the muscle provides maximum tension at all angles in which the joint moves and creates resistance. While the load on the muscle is at the lowest level in the middle of the free weights range of motion, its speed is maintained in the same way at the middle angles in the isokinetic dynamometer (Pincivero et al., 1997).

In the isokinetic test evaluations, the joint motion angle where the muscle is weak during the measurement is determined and the necessary studies are planned to close this deficiency. Thanks to the tests performed in this system, data on the comparison of the two opposite sides of the body extremities, the comparison of agonist and antagonist strength levels and ratios, and the general capacity and endurance of the muscle can be obtained (Baltzopoulos and Brodie, 1989). Although the reliability of the isokinetic test system and the results obtained are at high levels, it is very important to control the factors that may affect the test. The selection of parameters whose value is curious, the positions of the subjects during the test and the measurement angles are the factors that can affect the test and test results.

2. Main Parts of Isokinetic Dynamometer

Dynamometer: It is the section that can adjust the desired contraction type, joint movement angle and speed, and measure torque.

Test chair and other support apparatus: It includes apparatuses that will provide a fixed seat and isolation and stabilization of the person in order to analyze different extremities or regions.

Computer: It is the part used for the preparation of the desired protocols for the measurements to be made with a dynamometer and for starting these applications, in addition to calculating various parameters and analyzing the results (Brown, 2000).

3. Factors Affecting Results Values in Isokinetic Tests

Personal characteristics

- Age
- Height
- Gender
- Body Weight (kg)
- Athlete History
- Dominant Side
- Injury or disease state (Brochu et al., 2002).

4. Test Movements and Features

Joint Angle: Due to the relationship between the length and the tension and the biomechanical feature of the joint, the force and power generation revealed during the test may have different values at different joint angles.

Muscle Movement: Thanks to this system, force production can be revealed both by concentric (concentric) in the muscle length and by eccentric contractions. In this way, analyzes can be made on force, work and power. When the results of the studies on this system were evaluated, it was concluded that eccentric contractions produced more power than concentric contractions. As the reason for this; During eccentric contraction, both contractile and non-contractile elastic components are involved in the production of force. In concentric contraction, only the contractile structures participate in the contraction (Brown and Whitehurst., 2003).

Test Type: With this system, 3 main contraction types can be measured. These are expressed as isometric, isotonic and isokinetic.

5. Variables for Isokinetic Tests

Isolation and Stabilization: In parallel with the meaning of the word isolation, it is the removal of any external factor that will affect the results of the muscle or muscle groups included in the test during the test. The simplest way to do this is to ensure that the subject, who is seated on the dynamometer, sits optimally based on the determined dimensions and personal

characteristics. This process is called stabilization. In this process, the angles of the measured joint and the dynamometer must be exactly compatible with each other. It should be fixed with the help of belts so that the joints and muscles involved in the test are not affected by other parts of the body. In summary, it is necessary to fix all the factors other than the muscles or muscle groups that we want to work or to measure and to eliminate the effect of the test results (Brown, 2000).

Movement Axis: There is a fixed lever arm in the dynamometers where the test is carried out. The torque produced by the joints and muscles is recorded and transmitted by this apparatus. Therefore, it is very important that this lever axis and the axis of the joint under test are aligned and at an angle. If this importance is ignored, invalid and meaningless torque values may occur in the results obtained (Brown and Whitehurst., 2003).

Gravity Effect: Gravity correction must be adjusted for movements to be performed against gravity. It occurs in knee extension and flexion movements. This effect needs to be reset. Resetting this effect is even more important in hamstring/quadriceps ratios, which is the reciprocal ratio (Kannus, 1994).

Range of Motion (ROM: Range of motion): While performing the test, a bit of physiological and total range of motion should be evaluated together on the dynamometer. Physiologically, range of motion refers to the angle between the beginning and end of motion of the joint. Total range of motion refers to the range of motion drawn during the physiological range of motion. It is necessary to determine the range of motion in the tests, since the differences that will occur on the joint will affect the work and strength in the tests performed (Brown and Whitehurst., 2003).

Information about the test: The information given to the people who are planned to be tested should be given to all subjects in the same way. It should be clearly stated how the person participating in the measurement should perform the test and what is expected of him/her, and adequate practice should be given to adapt to the dynamometer.

Repetitions: Determining and telling the number of repetitions beforehand is very important for the data to be obtained at the end of the test. In studies to be analyzed for peak torque power, 5 repetitions of tests and 15-25 repetitions of tests should be performed in studies that will analyze endurance (Chan, 2001).

Resting time: 30 seconds – 3 minutes rest periods can be used in all tests performed on the dynamometer. While some researchers state that the resting time should be around 60 seconds in rest intervals (Parcell et al., 2002), other researchers say that an average of 30 seconds of rest can be in the ideal interval (Bottaro et al., 2005).

Angular velocity in measurements: Angular velocity in isokinetic dynamometers has rates ranging from 0°/sec to 600°/sec. During the test, the speed is determined according to the measurement purpose. In previous studies, it was observed that speed protocols did not significantly affect the values of force variables, whose order was the test output.

Exceeding the angular velocity and torque upper limit: The arm or leg area included in the test goes through a phase of free movement before encountering the resistance created by the

dynamometer. In places where the leg or arm exerts pressure on the resistance of the device in the line of power and torque created by the angular movement performed, the increase in torque on the device, especially during the deceleration phase of the movement, causes an unexpected deviation under normal conditions. A similar bias can occur in the last part of the acceleration phase. It is stated that the deviation in this torque curve may be due to the oscillation of the elbow that integrates the arm or leg into the device. In fact, such data to express real muscle strength are encountered especially at very high angular velocity values. It is important to consider this situation when analyzing the data obtained from these tests (Crenshaw et al., 1995).

Loading intervals: As mentioned before, isokinetic movements consist of 3 different phases. In order to reach effective and logical data, it is necessary to distinguish the 3 stages from each other and to include the values in the isokinetic test loading ranges in the analysis.

Calibration: It is necessary to calibrate regularly in order to obtain accurate and reliable results from isokinetic tests. It is important to calibrate the device every time it is turned on for testing. In addition, it is necessary to calibrate once a month with fixed and known weights (Brown, 2000).

6. Parameters Evaluated in Isokinetic Tests

Peak torque: It is expressed as the highest possible amount of torque produced at the joint opening by the muscle or a certain muscle combination included in the measurement during the test. In other words, it is the peak value on the torque curve obtained after the measurement. It is expressed as the most commonly used value in isokinetic measurements and is determined as a unit of foot-pound (ft-lb) or Newton-meter (Nm) (Brown, 2000).

Average peak torque: It is the average value of the peak torque resulting from the movement performed during the measurement. In repetitive movements during the test, this value can be considered as a much more important variable than the single peak torque value (Horvat et al., 1997).

Angle-specific peak torque: It is the value in terms of torque obtained from any movement angle during the measurement.

Torque body weight: It is the proportional value of the peak force output obtained from the test to the weight. It ensures that the resulting force output becomes personalized. The specific interpretation of the peak torque value obtained from the test to body weights helps to create another and new dimension for analysis. Individual differences can also be analyzed by dividing the peak torque and other work and power data by the weights of the test subjects.

Total work: The work value obtained in isokinetic measurements is the portion under the torque-joint range of motion curve.

Average power: It is obtained by dividing the automatically calculated work by the time required to complete the work. Its unit is Watt.

Peak power: It is expressed as the maximum power value that can be generated at the angular velocity and time at which the peak torque is obtained in the test. The acceleration capacity of

the torque occurring in the test body is expressed as the amount of power resulting from the contraction of the muscle or any muscle group in a period of one-eighth of a second. Again, it appears as an important data in the analysis of isokinetic data.

Peak torque development process: It is the value at which the peak torque value obtained from the test is determined at which speeds it develops. It normally occurs in the first 1/3 of the torque curve. However, if such a development occurs in the middle or last parts of the torque curve, it refers to any pathology that prevents the development of the peak torque during contraction. In these cases, it should be understood that the patient included in the test is not yet suitable for resuming activities in normal life.

Power loss rate: It refers to the descending portion of the torque curve on the analysis page. Under normal conditions, the descending part of this curve must be flat or convex.

Velocity-specific data: The force that the subject can produce during the test may vary depending on the velocity. When the speed increases, there may be a decrease in force production.

Force Decrease Ratio: It defines the part of the torque curve where downward bending begins. It shows the degree to which the person can produce force from the beginning to the last part of the movement.

Reciprocal innervation time: It is expressed as the ratio between the activation of the opposite muscles and the activation of the agonist muscle. If the patient has an important pathology, delays may occur at this time.

7. Muscle Ratios in Isokinetic Measurements

Bilateral comparison: It is the comparison of one extremity with the other in the lower or upper region. As a result of the analysis, differences exceeding of 10-15% are considered as asymmetry. Evaluation of this result together with other parameters obtained from the test may give more accurate results.

Unilateral ratios (Agonist/Antagonist): It involves comparing the relationship between opposite muscle groups (eg, quadriceps and hamstring) on one extremity. In such comparisons, it is revealed whether there are strength differences between muscle groups.

Ipsilateral ratios: Comparison of agonist and antagonist muscle groups of muscles in the same extremity. For example, comparison of the ratios of the quadriceps muscle and the hamstring muscle on an extremity.

Concentric / eccentric ratios: This movement pattern is used during testing and especially during many activities. When the eccentric and concentric contraction rates of a muscle group are compared with each other, it is expected that the eccentric contraction will be 30% more than the other contraction. Low rates obtained during eccentric contraction may indicate that there is a muscular pathology in general.

Endurance rates: Accurate information about muscle fatigue and recovery can be obtained by choosing test protocols for endurance.

8. Reasons for Preferring Isokinetic Tests

Reliability; In this test system, valuable results can be obtained by making a qualitative measurement of musculoskeletal system performance. Thanks to the objective data obtained, the strength and power values of the person being tested can be followed or their development can be recorded periodically.

Security; The resistance applied by the dynamometer during the test is in the same proportion to the force created by the person during the movement. Therefore, during the test, the person's skeletal muscles do not face more force than they can withstand. In this context, the risk of damage from the test is very low. The possibility of increasing muscle pain after exercise is also low (Bogdanis and Kalapotharakos, 2016).

Effectiveness; During isokinetic contraction, the muscles show maximal contraction at every angle of joint range of motion. This type of exercise is very effective in terms of strengthening because the muscles are dynamically loaded.

When pain or fatigue occurs during testing and exercise on the device, the muscle can continue to contract in harmony with the device. The force produced by contraction begins to decrease due to pain. Therefore, the resistance rate applied by the device also decreases and the exercise is continued at a lower intensity. In exercises performed with free weights, the athlete has to stop working out when she feels pain. In this test system, since the range of motion of the joint where the muscle or muscle group is not at sufficient capacity can be detected, special force loads can be applied to the muscle at the desired angle of motion. Thanks to this test, it is possible to compare different extremity ratios, agonist and antagonist ratios. In addition, information is obtained about the work capacity of muscle groups and the variables related to endurance.

During the test, information about his/her own performance can be presented to the athlete or the patient verbally, as well as the necessary graphics can be displayed with the help of a monitor. Torque curves obtained from the tests may have certain characteristics determined for some diseases. It has a high degree of reliability and accuracy in determining the power and torque levels produced by the muscles (Dvir, 2004).

9. Joint Movements Measured in the Isokinetic Test

In our body, isokinetic measurements of the lower and upper extremities can be made at different angles and speeds. Lower extremity measurement options;

- Hip abduction and adduction
- Hip flexion and extension
- Hip internal and external rotation
- Knee flexion and extension (sitting or prone)
- Tibia internal external rotation
- Ankle dorsal and plantar flexion (prone or supine)

- Ankle inversion and eversion

Upper extremity measurement options;

- Shoulder flexion and extension
- Shoulder abduction and adduction
- Shoulder internal and external rotation (90° abduction, sitting, standing, 90° flexion)
- Shoulder horizontal abduction and adduction
- Elbow flexion and extension
- Wrist flexion and extension
- Forearm pronation and supination
- Wrist radial and ulnar deviation

10. Advantages of Isokinetic Tests

- The test can be repeated as many times as desired.
- Different protocols can be created with isokinetic equipment specific to the test procedure.
- It isolates the joints.
- Data can be stored for later use.
- Athletes can be motivated by using visual feedback during the test.
- Some parts and equipment of the device also allow eccentric tests.
- This device allows accurately determined maximum resistance in the whole range of motion.
- It offers the option of working at different speeds at the determined maximum resistances.

Disadvantages of Isokinetic Tests

- Less originality.
- The device and necessary equipment are economically costly.
- The device must be calibrated at certain times.
- Muscle movements performed during the test may not be specific to all sports branches.
- The rapid and sudden torque increases during the test may be related to different factors besides the strength and power of the athlete.
- Since only the speed is controlled in the tests during the study, the effort made is at the minimum or maximum level.

- It does not allow all of the joints to work at the same time. The whole body cannot be involved in the test or study at the same time.
- It can take a lot of time to adapt the athlete to the device for testing different joints or areas.
- The fact that the athlete cannot show real performance with his capacity affects the accuracy of the data obtained (Dvir, 2004).

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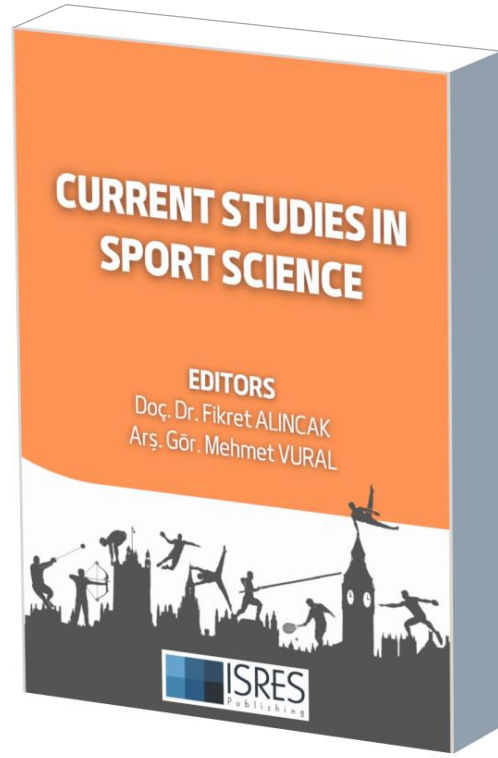
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