The Olympic Committee of Israel

Sports Medicine

Elite Sports

Coaches and Coaching

Events and Results
Dear Readers,

We are pleased to launch the 11th edition of the Olympic Committee of Israel’s Scientific-Medical Journal, in collaboration with the Committee’s Elite Sports Unit and Medical Commission.

The Israeli delegation to Tokyo 2020 returned from the Games adorned with achievements. These were the most successful Games in the history of Israeli delegations. It qualified for 18 Olympic finals in eight sports. Moreover, the Games resulted in four Olympic medals – three of them in sports that Israel had never won a medal before, and two of which were gold.

The ominous Covid-19 cloud ever present, the absence of crowds at the competition sites, and restrictions designed to keep participants healthy, made the Games unlike any before. The athletes and coaches of the Olympic delegation were provided with information and unique guidelines for the event, so that in addition to the impressive sport achievements accomplished, an additional success can be celebrated – zero cases of Covid-19.

What issues will be dealt with in the current journal? Muli Epstein discusses the adaptation to the Tokyo clock and climate, limitations due to Covid-19, and a project to predict the wind regime at the Olympic sailing site.

“Strong together” is the motto coined by the International Olympic Committee in Tokyo. In an article by Prof. Dan Nemet, you can read about how the Games were conducted in the shadow of the virus. Danny Oren and Ori Abulafia analyze the performance of the Israeli delegation in Tokyo, while Yair Talmon, Ori Abulafia and Tomer Seker describe the association between athletic achievements at a young age with achievements in adulthood; The application of the principles of hydrotherapy treatment for athletes is explained in an article by Dr. Maya Calé-Benzoor; What is the preferred type of implant for reconstructing an anterior cruciate ligament in a young athlete? This issue is debated in an article by Prof. Iftach Hetsroni.

The gynecologist Dr. Einat Haikin Herzberger deals with the issue of the female menstrual cycle and its impact on female athletes’ performance, Yair Talmon describes the use of a biomechanical profile to optimize the performance of Olympic athletes, and Idan Harat and Dr. Rotem Kislev-Cohen describe the contribution of exercise physiology to performance in elite sport.

Yarden Har Lev makes accessible the Olympic Studio – a fascinating series of video recorded panel discussions dealing with a variety of issues from the world of achievement sports. Finally in this issue, she and Suzy Yogeov present the Situation Report of the Olympic Committee of Israel which highlights the achievements and challenges of implementing gender equality.

The attached PDF file is an interactive file. Moving the cursor over the active links in the file and clicking on them will navigate you from the file itself to the full article, YouTube clips and websites where contents presented in the journal are expanded upon.

Wishing you a pleasant read,

Muli Epstein

Chief Scientist and Journal Editor

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Review of Scientific Activity in the Olympic Committee of Israel for Tokyo 2020

The Tokyo 2020 Games were the most successful in the history of Israeli delegations. In preparation for the Games, the Olympic Committee of Israel and its partners did everything possible to provide the delegation with important information and guidance on relevant issues, including adapting to the local time and climate, Covid-19 restrictions, and the wind regime in sailing.

The period prior to the Games was replete with logistical preparations, professional briefings, competitions and fitness tests, as well as official farewell ceremonies. The ever-present Covid-19 cloud looming over the event, coupled with the stringent restrictions and laws imposed by the Japanese, posed difficulties and challenges the athletes and members of the Olympic delegation had never previously experienced.

At the same time, the Olympic Committee of Israel, together with its strategic partners – the Elite Sports Unit and the Center for Sports Medicine and Research at the Wingate Institute, the Technion, the Weizmann Institute of Science, HypnoCore directed Dr. Anda Baharav, and the Israel Meteorological Service – continued to provide the athletes and coaches with essential information and guidance.

The following is a brief overview of some of the scientific actions taken during the pre-Games period:

Rapid adaptation to the local time: One of the challenges the athletes faced on the
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flight east to Tokyo and in the passage of six time zones was the ability to adapt quickly to the local time. The gap between the internal clock (“biological clock”) and the clock at the destination is known as “jet lag”, and causes difficulty sleeping, digestive problems, decreased concentration and a strange sense of asynchronization.

Each and every member of the delegation was given recommendations and rules of conduct before and during the flights, as well as the waiting hours at the airport and the first days in Japan. The recommendations were individually tailored for six different flight paths (disparate destinations at different times) including guidelines for when to sleep and when to stay awake, what and how much to eat, when to drink, when to be exposed to or avoid local daylight, and at what hours body functioning is likely to decline. The guidelines were designed based on the science of chronobiology, using a special algorithm in an application called Boost provided by Dr. Anda Baharav.

Climate: Another issue in Tokyo was the climate challenge. That is, high heat and humidity posed hostile conditions for any athletes competing outdoors: marathon runners, triathletes, cyclists, surfers and sailors, equestrians and archers. Two and a half years leading up to the Games, the Olympic Committee of Israel, via the Climate Forum it established, made preparations to deal with the expected challenge. Simulations were performed for functioning in hot climate conditions, body cooling equipment was tested, technology for measuring the core temperature was applied, and special clothing was purchased to screen UV radiation.

Before leaving for Italy for a training camp in high altitude and hot climate conditions, the Olympic marathon runners underwent a physical readiness test that included running 32 km in climatic conditions simulating those to be expected at the Sapporo, the city that hosted the Olympic marathon. Physiological measurements were taken pre-run, during the run and post-run including body weight, pulse, lactate, loss of fluids, drinking
control, and comfort questionnaires, among others.

Covid-19: The situation in Japan and the severe restrictions imposed on participants in the Games required delegation managers to take strict precautions. The greatest concern was of course contracting Covid-19, or other viruses that would emerge after a “cold” winter, which could have discontinued the Olympic dream for athletes and may have even brought down others.

A document written by Prof. Dan Nemet, the Medical Director of the Olympic Committee of Israel, detailed the guidelines for flying safely and functioning in a hygienic environment.

Wind regime at the Olympic sailing site: During the eight months leading up to the Games, Prof. Paul Feigin and other researchers from the Technion Laboratory of Statistics conducted statistical analysis and forecasts of the winds in Tokyo Bay. The aim was to predict the directions and speed of the winds in the sailing route for that day. For this purpose, in the morning the researchers operated the Weather Research and Forecasting (WRF) model, which gave half-hourly weather results in an area that includes the Bay (meso-scale). Local information was further added to predict the winds in each relevant trajectory (micro-scale). This information should be based on historical data of the winds in the same bay in previous years in the same season. The task facing the researchers was to establish an appropriate methodology, and to design and create products that would provide the competitors with the information needed to plan their sail in real time. The methods applied by the researchers included the following:

• Descriptive statistics and presentation of findings with tools adapted to show directions and speeds
• Multivariate time series analysis
• Machine learning such as recurrent neural networks.
Covid-19, Tokyo 2020 and the Olympic Games, July-August 2021

The Tokyo 2020 Olympic Games were the most successful in the history of the State of Israel. For the athletes and the accompanying staff, these Games differed from previous ones, as fears of a massive contagion in the world’s biggest sporting event loomed over them. Postponing the Games by a year, prolonged preparations, restricted movement, maintaining hygiene and social distancing, and daily Covid-19 testing turned the Games into a unique experience. The Games were conducted in an exemplary manner, under severe restrictions. Fortunately, the organizers’ efforts to ensure the safe being of the participants and the residents of Japan were successful.

The Covid-19 epidemic is a reminder of how difficult it is to predict what each day might bring. In Israel, we are currently experiencing an increase in the number of people infected, especially with the omicron variant, and today, more than two years since the outbreak of the epidemic, the unknown exceeds the known. A few months ago, the Israeli delegation returned from the Olympic Games in Tokyo, which proved to be the most successful in Israeli history. In the Games 11,417 athletes from 206 countries competed in 339 events in 33 sports. For the participants of the Olympic Games, both athletes and staff, Covid-19 provided an extraordinary experience, beyond that anticipated by the very Games. The Covid-19 epidemic accompanied the Israeli delegation throughout the preparations for the Olympic Games in Tokyo. Whether the Games, which were postponed by one year, would in fact take place was uncertain until near the opening of the event. The members of the delegation were updated throughout the preparation period regarding the stringent Covid-19 procedures and were required to strictly follow them. The Olympic Committee of Israel established a team responsible for Covid-19 issues. The team worked with the organizers prior to the arrival of the delegation in Japan.
and provided them with the vast number of documents required for the delegation’s stay at the various sites. The organizers of the Games encouraged participants to get vaccinated, and the International Olympic Committee provided free vaccinations to delegations from countries where the vaccine was unavailable. It is estimated that some 85% of the Olympic Village residents were vaccinated.

The members of the delegation were required to report their health before arriving in Japan and were tested for Covid-19 twice within the 96-hour period prior to departure for the Games. Upon arrival in Japan, all members of the delegations were tested for Covid-19 at the airport. A total of 42,971 tests were performed at the airport, 37 of which were found to be positive (0.086%). Those who tested positive were obliged to go into a 14-day period of isolation in Japan.

For the first time in history, in order to reduce the risk of infection, it was not possible for spectators to attend the Olympic Games. The movement of participants was restricted and visitation to tourist sites, shops and restaurants outside the Olympic Village was not permitted. Participants were required to wear a mask at all times, use disinfectants regularly (disinfectant facilities were found throughout the Olympic Village and competition sites), and maintain hygiene and social distance. The dining rooms in the Olympic Village were adapted to accommodate social distancing, and partitions separated between diners. To avoid crowding, the status of the line waiting to enter the dining room could be checked in an app or a screen situated at the entrance of each residential building.

During their stay in Japan, participants were required to report their health status on a daily basis in the app. Members of the delegation were asked to measure and report their temperature on a daily basis. Temperature was also taken at the entrance to training and competition sites. All participants filled out a Covid-19 survey on a daily basis as well.

During the Games (up to August 9), a total of 676,789 Covid-19 tests were taken, averaging 31,000 tests per day. Of all the tests, 464 were found positive for Covid-19, most of whom were of pre-Games residents of Japan. One hundred and fifty-seven of the subjects who tested positive (34%) were not Japanese citizens. Within the Olympic Village, 67 participants (33 athletes and 34 staff members) tested positive for the virus, about 70% of whom were unvaccinated. The athletes who were found positive for Covid-19 were isolated and were not able to participate in the Games. Salient among them were representatives of the US delegation — world champion in pole vaulting, Sam Kendricks, and the young tennis player, Cori Gauff.
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The cumulative rate of subjects who tested positive in the Olympic Village was only 0.02% and for an extended period of time the Olympic Village was a “sterile bubble,” clean of Covid-19. Among the Israeli delegation, all tests throughout the Games were found negative and a single case of a false positive was recorded (which turned out negative in the PCR test).

Japan, which entered the Games during a rising wave of the virus and was concerned about massive infection, conducted genomic sequencing of the positive cases found during the event. Analysis of the sequencing indicated that the increased incidence of cases in Japan at the time were associated with an endemic specie whose source was in Japan (AY.29) rather than viruses found in other countries. It was also reported that the local and non-local cases that were found positive during the Games were infected with different Covid-19 strains. The Games seem to have had little effect on morbidity in Japan. Moreover, the common strain found in Japan was not spread to the countries that participated in the Olympic Games.

Maintaining hygiene and social distancing led not only to the control of the spread of Covid-19, but also to a significant reduction in the incidence of other infectious diseases (respiratory diseases, gastrointestinal diseases, etc.) compared to previous Olympic Games. Moreover, during Tokyo 2020, alongside covid testing, 6,200 doping tests were conducted on 4,255 athletes from 171 countries. The tests were conducted in competition (65.4%) and outside it (36.4%), six of which were found suspicious (0.09%).

In conclusion, Tokyo 2020, the largest sporting event in the world which took place in 2021, was held under the restrictions of Covid-19, demonstrating impressive cooperation between people from different continents, countries and religions proving to be a unifying event, an event of brotherhood and peace, instilling hope for recovery. A victory of the Olympic spirit!
A fascinating series of panel discussions dealing with a variety of issues from the world of elite sport is now available for direct viewing on a digital platform.

In January 2021, the Olympic Committee of Israel and the Academic College at Wingate launched the Olympic Studio, an innovative project aimed at making issues from the content world of the Olympic Movement accessible to the general public through an educational and multidisciplinary discourse among academics, experts and prominent athletes.

The main purpose of the Olympic Studio is to be an up-to-date, relevant and available content resource for the community of sport enthusiasts, in general, and active sport participants, in particular. The experts in the Olympic studio give viewers an opportunity to expand their knowledge on diverse sport topics through short and fluid discussions spiced up with extraordinary stories, and invite them to take part in professional discourse via social media.

More than a quarter of a million people have been exposed to the programs from the first season, which were digitally broadcast by the Olympic Committee of Israel from January 31 to June 6, 2021.
List of Programs
The following is a list of Olympic Studio programs available for viewing at any time:

- **Genetics and Environment**
The genes which enable the identification of the next generation of elite athletes and the creation of a personalized training process
Participants: Mr. Muli Epstein, Dr. Iddo Nevo, Prof. Nir Eynon and Dr. Ziv Zwighaft
Length: 43:43 minutes
To view - [click here](Hebrew)

- **Safeguarding in Sport**
The factors, dangers and central agents of athlete abuse and methods of coping with the phenomenon
Participants: Ms. Vered Bouskila, Ms. Suzy Yogev, Mr. Roy Samuel and Mr. Ori Kedar
Length: 41:27 minutes
To view - [click here](Hebrew)

- **Doping in Sport**
The long way the world of sport has made from the lawless use of illicit substances to a policy of strict enforcement
Participants: Mr. Muli Epstein, Mr. Moti Basok, Dr. Daniel Hershtain and Ms. Amit Ivri
Length: 40:02 minutes
To view - [click here](Hebrew)
• **Career and Family Challenges**
The key to an optimal balance between family life and an Olympic career - How to be a champion parent
Participants: Ms. Vered Bouskila, Ms. Adi Harpaz, Mr. Arik Zeevi and Ms. Moran Samuel
Length: 33:54 minutes
To view - [click here](#) (Hebrew)

• **Sport and Gender**
The physiological and anatomical differences between men and women, coping with the issue of transgender athletes, and the phenomenon of intersex in competitive sports
Participants: Mr. Muli Epstein, Ms. Adi Bichman and Dr. Liat Perl
Length: 43:42 minutes
To view - [click here](#) (Hebrew, English subtitles available)

• **Tradition and Innovation in the Olympic Program**
The role of tradition in the face of economic benefits to be gained by the Olympic Movement in choosing medal events in the modern Olympic Games
Participants: Dr. Amichai Alperovich, Ms. Yael Arad and Dr. Iddo Nevo
Length: 40:44 minutes
To view - [click here](#) (Hebrew)

• **Media Coverage of the Olympic Games**
The role of sport media in covering Olympic sports and its mutual relations with athletes in the age of social media
Participants: Ms. Miri Nevo, Mr. Ori Fadlon, Ms. Neta Rivkin and Mr. Sharon Davidovich
Length: 32:13 minutes
To view - [click here](#) (Hebrew)
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- **Technology and Innovation in Sport**
  The integration of new technologies and coping with the challenge of building a two-way bridge between the world of science and the world of sports
  Participants: Mr. Muli Epstein, Ms. Shira Baum, Prof. Alon Wolf and Mr. Gal Nevo
  Length: 34:30 minutes
  To view - [click here](Hebrew)

- **Olympic Economy**
  An overview of the components of Olympic success: What is the connection between athletes, dreams and big money?
  Participants: Ms. Yael Arad, Mr. Yoav Bruck, Mr. Alex Gilady and Ms. Galit Polak
  Length: 32:46 minutes
  To view - [click here](Hebrew, English subtitles available)

- **Initial Identification and Development of Young Athletes**
  Predicting future achievements based on performance analysis of young athletes who grow up to become active in the community versus those who are active within the sport academy framework
  Participants: Mr. Yoram Cohen, Prof. Ronnie Lidor, Dr. Leonid Kaufman and Ms. Neta Krumer
  Length: 35:56 minutes
  To view - [click here](Hebrew)
Fostering gender equality and developing women’s achievement in sport excellence is one of our key tasks at the Olympic Committee of Israel.

As the umbrella organization of sports in Israel, we have an important role to play in creating social change, accelerating processes and leading gender equality in sports at all levels and for all age groups.

The current situation presented in this document puts a spotlight on the achievements and challenges through two courses of action:

The Gender Standards Index (GSI) – The Olympic Committee of Israel annually reviews the GSI which serves as a strategic action guide. The GSI defines the desired standard and results in each of the GSI’s ten parameters. The desired results are formulated in a measurable and achievable way.

Purpose of the Gender Standardization Index:

• To initiate prompt substantial change by standardization for the Olympic Committee of Israel

• To serve as a model for sport organizations united under the Olympic Committee of Israel

• To guide in the design of a work plan and required actions

• To providing a tool for evaluating the effectiveness of our activities

• To assess the degree of progress by the Olympic Committee of Israel

Monitoring - The monitoring process provides information and a comparative picture of women in relation to men in ten core areas. Monitoring is one of the tools for following up on the implementation of the gender policy and its integration within the organization while maintaining the principles of transparency, supervision and continuous improvement.

Monitoring is performed by scanning the parameters established in order to identify inequalities, to address irregularities and prioritize projects that advance their reduction.

To view the Situation Report of the Olympic Committee of Israel - click here
The anterior cruciate ligament of the knee (ACL) is one of the most crucial structures for keeping perfectly synchronized and congruent knee motions. Athletes who are involved in sports with cutting, pivoting, jumping and decelerations, are unlikely to perform well if the ACL is completely unstable following an injury. In these circumstances, ACL reconstruction surgery is recommended. However, the downside of surgery is that it is followed by a long task-based process which usually takes about a year before a relatively safe return to sports is possible. To achieve this goal of safe return to sports, three principles must be met at the completion of the rehabilitation: (1) recovery of the knee extensor mechanism strength alongside a normal agonist/antagonist ratio; (2) recovery of painless knee range of motion; and above all (3) recovery of physiological knee ligament stability. If these are not met, there is a serious risk of a re-tear of the ACL (graft) which can lead to devastating consequences and the cessation of the athlete’s professional career.

**What’s Your Graft Choice in ACL Surgery? Changing the Paradigm in the Last Decade for Young Athletes Who Need ACL Reconstruction**

One of the most prevalent debates among sports surgeons which accounts for extensive world-wide research involves which type of graft is the most suitable for reconstructing the ACL in athletes. Until a decade ago, using the autologous hamstring tendon, a highly popularized graft choice for ACL reconstruction, was our preferred graft choice for Israeli athletes. This choice relied on the fact that extensor mechanism recovery, one of the goals of rehabilitation as above mentioned, becomes easy and relatively fast since the autograft is not part of the extensor mechanism. Recently, we have evaluated our experience using this graft with a 5-to10-year follow-up by means of clinical and biomechanical assessment tools. Our conclusions, published in international literature, emphasize the importance of physiological knee laxity and reestablishment of muscle torque symmetries in this respect [1, 2]. During the last decade however, concerns
have arisen regarding failure rates of this graft choice. High-quality research provided increasing evidence showing higher graft failure rates in high-risk populations when the hamstring tendon was used in isolation compared to using other ligaments for ACL reconstruction [3, 4]. In these studies [3, 4], “high-risk” patients for failure were defined as young men (under the age of 25) involved in pivoting sports and having a high-degree of knee instability. Other ligaments that showed reduced graft failure rates were the autologous central-third patellar tendon or the addition of anterolateral ligament reconstruction (i.e. lateral extraarticular tenodesis) when using the hamstring tendon. Since a decade ago, we have changed our graft choice for ACL reconstruction in most cases to the autologous patellar tendon, with some modifications in a tunnel preparation technique based on increasing world-wide knowledge of the “anatomical ACL reconstruction” concept. With these changes in our ACL reconstruction paradigm (i.e. graft choice and tunnel preparation technique), we started testing our own experience in a clinical research design. We are currently summarizing our experience of over a decade by means of clinical tests and biomechanical evaluations in order to investigate how this change in the surgical paradigm has affected the clinical outcomes and the return to a more physiological knee performance at a 5-year or longer follow-up. Initial findings already show a clear benefit of the changing paradigm we have implemented in reducing graft failure rates and enabling young athletes involved in professional gymnastics, martial arts, and other areas of professional sports higher rates of return to their sport performance. Alongside this important shift we have made in treating Israeli athletes, future world-wide investigations may allow us to also refine criteria for adding lateral extraarticular tenodesis in selected cases.

In summary, our surgical management for knee injuries in athletes has shifted based on
evolving global research over the last decade. Our preferred graft choice today for ACL reconstruction in high-risk high-level athletes is an autologous central-third patellar tendon graft. In cases of specific sport professions that demand repeated and long-standing kneeling positions, such as wrestling, we consider using the autologous quadriceps tendon (to avoid pain at the distal patellar pole which can occur with a patellar tendon harvest). In other cases, we consider autologous hamstrings, but this should be accompanied by concomitant lateral extraarticular tenodesis procedure. Moreover, repairing instead of excising meniscus tears [5] is also seriously considered today in our practice to reduce ACL graft loads and anterolateral rotational forces in these cases. Above all, in order to improve patient care and decision-making, our surgical approach is continuously evolving and tested through clinical studies by functional and biomechanical assessments at medium- and long-term follow-up.

One of the great myths regarding the female body is that menstruation is necessary and essential for health. Menarche at adolescence indeed signifies the proper functioning of the hormonal system, however menstrual bleeding itself is not necessary for the purpose of maintaining proper functioning. Contrary to how the menstrual cycle was perceived in the past, it does not "cleanse the body" and has no health function. Moreover, many women suffer from various symptoms that accompany menstruation - pain, anemia, mood swings. Therefore, various measures have emerged over the years which make it possible to reduce the effects of the menstrual cycle on the lives of women. This can be achieved by reducing the duration of menstruation, i.e. reducing the number of days or the intensity of menstruation. There is also an option to skip cycles and thereby reduce the number of months of menstruation in the year. Most often, in the fertile years, hormonal therapies can be used. The more familiar form is the use of pills. However, for those who are reluctant to take oral medication or to taking medication on a daily basis there are other options, such as patches or a flexible vaginal ring which contain similar substances, but enable a different form of administration and reduced frequency.

Classically, hormone therapy is used as a means of contraception, but its use has other benefits, most notably, a reduction in the duration and intensity of menstruation. For example, within the wide range of contraceptives offered for use, you can find several types of pills, with each type having its advantages and disadvantages. A wise choice of a contraceptive in coordination with a gynecologist can enable the desired effect and lead to a significant improvement in quality of life. The menstrual cycle will become lighter and in some women it will even cease as long as the contraceptive treatment is continued.

Since menstrual bleeding itself has no significance for health, it is possible to take the hormonal treatment continuously and thereby reduce the frequency of the menstrual cycle and even to schedule it optimally for a training program - for example, menstruation once every three months instead of
once a month. The continuous use of contraceptives is a suitable option and there are even certain types offered in a package adapted for continuous use.

Another option that is currently becoming more common among young women is the use of an intrauterine device. The device is a small contraceptive that is inserted into the uterine cavity by a gynecologist. The device can be kept for a period of several years depending on its type. Its main advantage over the options abovementioned is that it is inserted with one single action and there is no need to remember to use it repeatedly. There are non-hormonal and hormonal intrauterine devices, where the hormonal intrauterine devices, in addition to being a very effective contraceptive, may also result in a significant reduction in the duration and intensity of menstruation, and in a minority of women there will even be a complete cessation of menstruation during use.

One of the concerns of women in the context of the use of hormonal therapy is the effect on their fertility. However, there is no evidence that the use of pills increases the risk of fertility problems. It is important to understand that the treatment allows relief of symptoms related to the menstrual cycle, but does not constitute a solution to these problems. Therefore, upon termination of the treatment, their recurrence is expected.

Each of the treatment options mentioned requires prior consultation with a gynecologist in order to check the suitability of the treatment for each woman individually and to rule out personal risk factors that constitute a contraindication to use.

In conclusion, the menstrual cycle is another struggle with which female athletes must cope. Each experiences it differently and with a different intensity, but many will agree that the cycle may have an effect on their performance. Knowledge of the various treatment options for minimizing the effects of menstruation is essential and may allow athletes to have better control over their performance.
Rehabilitating the injured athlete presents special challenges to the physiotherapist. While a safe and timely recovery is the first concern as with any orthopedic patient, the population of elite athletes has additional, unique needs. Minimizing time loss is of exceptional importance. In addition to a complete and functional healing process, elite athletes need to preserve and even develop further athletic abilities which will allow them to fully materialize their potential upon returning to their sport.

With these challenges in mind, the staff at the Physiotherapy Department at the Wingate Institute - The Israeli National Institute for Sport Excellence, developed a unique program of pool and hydrotherapy services to augment rehabilitation and recovery of injured athletes at our facility. The program takes advantage of training facilities at the Aquatic Center at the Wingate Institute which houses a 25m-long swimming pool with graded depth ranging from 40cm-2m, as well as a recovery pool kept at a spa-like temperature and equipped with jets.

Two staff physiotherapists who are also qualified hydrotherapists developed several program approaches according to specific indices. We began screening our athletes during their initial evaluation and identified suitable candidates according to the listed categories. All appropriate patients began a complimentary hydrotherapy program in addition to their physical therapy schedule. The program approaches that were designed consisted of the following categories:

- Acute injury management (i.e., ankle sprains, deep water immersion and gait)
- Joint ROM, strengthening and supplementation of manual therapy techniques at early phases of rehabilitation
- Functional rehabilitation and sport-specific exercise progressions
- Aerobic conditioning (deep water running)
- Recovery activities (fun games, more traditional aquatic relaxation techniques)

The pool or hydrotherapy program consists of 1-2 weekly
sessions with additional self-practice, encouraged as needed. This program was accepted with great interest and enthusiasm by athletes, coaches, and therapists alike. With the availability of a pool, all that is needed is one lane and some specialized assistive devices (belts, foam noodle, barbell weights, etc.). Several athletes who had been constrained due to injuries or limited by Covid-19 training restrictions were able to preserve athletic performance (one female marathon runner with a sacral stress fracture maintained a deep water to running training load for 3 months and experienced an improvement in personal best time in a half marathon race). We currently use pool and hydrotherapy training as an effective supplement to our athletic rehabilitation, re-conditioning, and maintenance programs.

The following links are examples of pool and hydrotherapy application:

• Joint ROM following knee ligamentous surgery
• Functional rehabilitation – lower extremity in runners (mov. # 1)

• Sport-specific shoulder rehabilitation of a badminton player with rotator cuff repair (mov. # 2)
• Functional rehabilitation of ACL in a judoka utilizing a simulated mat (mov. # 3)

Injury prevention and robustness programs are currently developed for overhead sports (women’s volleyball) taking advantage of the possibility of loading the trunk and shoulders while “sparing” extra load from the lower extremities.

Acknowledgements: We wish to thank the physiotherapists, Alon Yehiel, PT, MSc and Shaley Cohen, PT, BSc.
At the Tokyo 2020 Olympic Games all eyes (and cameras) were on the accomplished athletes. The physical, technical and mental abilities were remarkable and awe-inspiring. Behind every runner, swimmer, gymnast, judoka, there usually stands a team that provides wide and varied professional support. First and foremost, the athletes are monitored by physicians, physiotherapists, nutritionists, mental trainers and exercise physiologists. In this brief article we will present the activities and scientific accompaniment given to Olympic athletes by the Department of Physiology at the Center for Sports Medicine and Research at the Wingate Institute.

We are often asked what exactly is the job of an exercise physiologist in the context of accompanying an elite athlete. The answer is complex and varied. The work usually integrates adjusting and conducting a wide range of laboratory tests to assess functional abilities and to assess components of physical ability relevant to each sport discipline. It also requires going out to the field in order to become familiar with the characteristics of training and competitions of that specific sport discipline and to conduct tests accordingly.

When beginning to work with a particular sport discipline, the coaching staff is introduced, the unique needs are identified, the characteristics of the discipline are examined (physically, technically, metabolically, including requirements for competition, work/recovery ratio, etc.) and a joint decision is made regarding the appropriate approach to accompany the team. For example:

• The selection of test batteries to assess physical abilities relevant to the discipline and their implementation at distinct times during the year
• Assistance and support related to issues such as load regulation and recovery, monitoring wellbeing, monitoring sleep, heart rate responses and rate of perceived exertion (RPE) over time
• Use of appropriate statistical indices to convey the information in a quick and convenient manner to the coaching staff in order to improve training processes and to provide coaches with professional and up-to-date information
• Providing answers to questions from the field by
conducting a research-oriented project
A project as described in the last item was recently carried out with the Israeli beach volleyball national team when the coaching staff was interested in finding out how the degree of players’ fatigue affects their level of performance during a tournament. In a beach volleyball tournament, players are often required to play two to three games on the same day with breaks of two to three hours between them. In addition, the coaching staff was interested to know whether one player is affected differently from another when the opposing team directs the serves towards a particular player throughout the game in comparison to the other player.

In order to answer these questions, a relevant literature review was first conducted to check if these issues have been previously investigated. After reviewing the literature, a test day simulated a tournament during which various physiological indicators were examined to determine the degree of fatigue and the decrease in the level of performance. Physiologists were also joined by the team’s nutritionist in order to collect additional data that, in combination with the physiological indices, provided a more complete picture. The indices selected were measurements of lactate concentration, RPE, jump height and sprint. A decrease in performance (jump and sprint) can indicate neuromuscular fatigue in those indices considered most relevant to success in a game. The number of jumps performed during the game was also assessed. The measurements were taken immediately before and after each game.

An analysis of the results showed that most of the players did not have a significant decrease in performance throughout the simulated tournament. Additionally, no significant difference was found between the two players. The results confirmed similar findings from other studies. A number of explanations are possible. It may be that not the same effort is invested in a simulated tournament compared to a real one. Another possible reason offered by the coaching staff is that fatigue is usually noticeable only on the second day of the tournament and not on the first. In light of the data, conclusions have been drawn and a further study will be conducted to further address these issues in the future.

In conclusion, the aim of physiological accompaniment is to help athletes enhance their training processes and make them more efficient in order to enable them to maximize their performance. Good communication and trusting relations between the coaching staff and the scientists enables the implementation of projects and allows physiological accompaniment to lead to successful results in the long term.
The most notable achievements at Tokyo 2020 were the gold medals won by the gymnasts, Artem Dolgopyat and Linoy Ashram. This is the first time in the history of the Israeli Olympic delegation that two gold medals are achieved. Together with two additional bronze medals won by the judo mixed team and by Avishag Semberg in taekwondo, Israel has broken the threshold of two Olympic medals. Israel’s achievements in the Games placed the delegation in the 39th place on the medal table, according to the number of gold medals achieved, and in the 47th place on the table according to the total number of medals - the highest ever ranking of an Israeli delegation. For comparison, in Rio 2016, which was considered a success, the Israeli delegation was ranked 57th in the overall medal ranking, without a gold medal.

In fact, 31 percent of the Olympic medals won by Israeli athletes to date were won...
at Tokyo 2020. Prior to the Olympic Games, the Olympic Committee of Israel and the Elite Sport Department set a target of winning a medal in a sport in which Israel has yet to win. In Tokyo 2020, three medals were won in new sports – Taekwondo (Avishag Semberg), artistic gymnastics (Artem Dolgopyat) and rhythmic gymnastics (Linoy Ashram) – in addition to the judo mixed team who won the fifth medal in this sport since Barcelona 1992.

Another goal set by the National Olympic Committee and the Elite Sport Department before the Games was to qualify to 10 finals. The success of the delegation was expressed in qualifying to 18 finals in nine disciplines. By comparison, at Rio 2016 the Israeli athletes qualified to five finals and in London 2012 to seven. In addition, the Olympic delegation included a ballgame sport – the baseball team finished in fifth place – an achievement which has not been reached since the Montreal football team’s participation in 1976.

One of the most notable record achievements in these Games was the fourth place achieved by the open water swimmer, Matan Roditi. This was the first time that an open water swimmer from Israel managed to qualify for the Games and Matan exceeded expectations in the competition itself. Another swimming accomplishment in the Games was achieved by Anastasia Gorbenko who became the first Israeli female swimmer to qualify for the Olympic finals by competing in the 100-meter backstroke. An additional record achieved in the Games includes the first time in which two competitors, the brothers Shachar and Ran Sagiv, represented Israel in the triathlon. Shahar set a record achievement for an Israeli in the event – 20th place in the individual competition. In the individual rhythmic gymnastics event, two gymnasts qualified to the finals – Linoy Ashram who won a gold medal, as above mentioned, and Nicol Zelikman who placed seventh. On the road bike, the female rider, Omer Shapira, was the first Israeli rider to compete at the end of the race against the clock, and also set the best result of an Israeli rider in the road competition – 24th place. Another record achievement was recorded by Maru Teferi who finished 13th in the marathon.

The Israeli success was expressed not only in medals and finals. The Israeli delegation included 90 athletes, almost twice as many as in Rio 2016, who competed in 19 different disciplines – the highest number ever, almost twice as many as in London 2012, where the delegation’s athletes competed in 10 disciplines. In addition, at Tokyo 2020, Israel was represented for the first time by athletes in the following sports: archery, baseball, equestrianism, surfing and marathon swimming.
The successful Games followed a fruitful Olympic cycle which was more successful than previous ones, and gave a hint of what was to come. The Israeli Olympic athletes won 38 medals in World Championships and European Championships in the last Olympic round (excluding 2021), compared to 29 in the Rio 2016 cycle and 27 in the London 2012 cycle. The last Olympic cycle was also productive in terms of medals in major competitions at young ages (cadets, youth, and U23). The young Israeli athletes won 57 medals, compared to 43 in Rio 2016 and 24 in London 2012. It is hoped that success of the young athletes in the Tokyo 2020 cycle will be translated to success in Paris 2024 and Los Angeles 2028. These results offer a beacon of optimism towards the two upcoming summer Olympic Games. Analysis of the results of the delegation of young athletes indicates that 88 percent of the athletes in the Tokyo 2020 delegation were on the youth rosters and 100 percent of the finalists in Tokyo 2020 were on the youth roster (excluding those athletes who could not appear on the rosters as they had not yet been naturalized as Israeli citizens until they became senior players). It can be concluded that achievement at a young age is an essential milestone for qualifying for the Olympics and for success in the Games.
In conclusion, it can be said that the past Olympic Games were the most successful in the history of Olympic sport in Israel, both in terms of the number of medals, the size of the delegation, the level of achievement and in the overall scope of the Olympic cycle. As such, the Israeli delegation at Tokyo 2020 has set a new standard for future Olympic delegations.
Identifying talented young athletes with potential for success in the international arena in adulthood is one of the main topics of current discussion in the field of elite sport. Many countries are increasingly investing resources in building regional and national programs for the early detection of talented young athletes. The goal is to focus resources on these athletes and to develop the range of abilities relevant to their sport (Abernethy, 2008). In many countries it is common to start focusing on young people with athletic talents as soon as they demonstrate an ability to succeed in the international arena (Bundesamt für Sport, BASPO and Swiss Olympic 2015). The definition of such ability varies from country to country, but proof of ability can be expressed by winning a medal or qualifying for the finals in major competitions (i.e., continental championships, world championships), at relevant ages. Processes outlined by policies for talent identification of outstanding young athletes are accompanied by the burning question – is there really a significant link between sport achievements at a young age and success in adulthood? Such a link would justify a focus on specific athletes from a young age by the sport system. As part of the activities of the Elite Sports Department, we have attempted to examine the issue through a comparative analysis of the results of

Is there a significant association between athletic achievement at a young age and success at an adult age? The existence of such a link justifies a focus on specific athletes at an early age by the sport system. In the Elite Sports Department at the Wingate Institute, we examined this issue by comparing the results of young athletes in world and European youth championships with the results of senior athletes in major competitions in a number of selected sport branches.
junior athletes in World and European youth championships with the results of senior athletes in major competitions in a number of selected sports.

**Approaches to examining the association between athletic achievements at young and adult ages**

Two main approaches examine the association between athletic achievements at a young age and achievements in adulthood:

- **Top-Down (TD):** According to this approach, a population of elite athletes with achievements in adulthood is selected and their achievements at a young age are examined. This approach does not take into account junior athletes with achievements who have not reached achievement levels as elite senior athletes. Thus, the TD approach helps to answer the question whether achievements at a young age constitute an important milestone for success in adulthood.

- **Bottom-Up (BU):** According to this approach, a population of junior athletes with achievements are selected and whether they have reached achievement levels as elite senior athletes is examined. This approach does not take into account elite senior athletes who did not record achievements as junior athletes. Thus, the BU approach helps to answer the question of whether achievements at a young age may be used as a measure for predicting and evaluating the chances of success in adulthood.

With the help of the website Gracernote.com (a platform for collecting and analyzing information about elite sports), as of 2009 the Elite Sports Department has collected results of competitions in Olympic Games, World Championships and European Championships for adults. As of 2006, it has collected results from World and

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<th>Table 1 – BU percentages according to sport</th>
<th>Table 2 – Percentages according to sport</th>
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<td>Junior N and Senior N represent the number of athletes who participated in corresponding junior and senior championships and reached achievements according to criteria.</td>
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European Youth Championships for junior male and female competitors. In order to examine links in achievement results between the two age groups, data on junior and senior achievements were crossed bi-directionally. The data analysis was divided according to the two approaches of TD and BU analysis. Data were examined from the following 11 Olympic sports: swimming, judo, triathlon, athletics – medium- and long-distance runs (800 m and above) and short-distance runs (100 to 400 m hurdles), sailing (RSX and 470), artistic gymnastics, fencing (épée and foil) and taekwondo.

The results can be divided into four types:
1. Sport disciplines for which both BU and TD percentage rates are high: This finding indicates the highest correlation ratios among the different types. There is a high chance of success in adulthood if achievements have been reached at a young age. Moreover, athletes with success in adulthood had recorded successes at a young age. It can be concluded with caution that success is achieved in adulthood following achievements recorded at a younger age.
2. Sport disciplines in which BU percentage rates are high but TD percentage rates are low: This finding is of some interest. While there seems to be an incentive to invest in junior athletes with achievements, high success rates in adulthood can be found even when no achievements were reached at a young age. Such cases can be found particularly in the discipline of artistic gymnastics.
3. Sport disciplines in which TD percentage rates are high but BU percentage rates are low: Though without statistical significance, the RSX discipline provides an example of a phenomenon in which the success rate in adulthood is not particularly high, despite recorded achievements at a young age (BU). Notwithstanding, it can be noted that achievements in adulthood among athletes correlate with achievements from a young age (TD) indicating that success at a young age is still a significant milestone.
4. Sport disciplines in which both BU and TD percentage rates are low: Such examples can be seen in athletics and taekwondo. Results indicate a phenomenon in which the chance of success in adulthood is low even if achievements were recorded at a young age (BU) and vice versa. Those with achievements in adulthood do not necessarily have significant achievements at a young age (TD). It can, therefore, be concluded that in these disciplines, success at a young age does not constitute a significant milestone in the athlete’s career.
An analysis of the reasons that led to the results discussed in this review requires an examination of each discipline separately. The outcomes could be due to a variety of factors, including technical, physical and mental characteristics, competition structure, use of technology, among others. Still, there seem to be disciplines in which it is worthwhile to nurture athletes (boys and girls) who have reached achievements at a young age, if every achievement is considered equally. Analysis of the data shows that the trends are similar between males and females in both junior and senior levels.

A similar data analysis should also be conducted among Israeli athletes in the various disciplines. This may shed light on how to optimize the potential of training teams and their support, and whether they meet European standards. Moreover, analysis should be extended to the younger ages of cadet athletes. In modern elite sport, the process of fostering young talents requires a significant investment of resources. It should be examined whether the data point more in the direction of horizontal work or a specific focus on these age groups.

References
Elite Sports

Sport performance is a complex and multi-factorial phenomenon. High levels of performance in any sport discipline can be achieved in more pathways than one. From a general perspective, the underlying factors behind the final performance in sport are related to most, if not all, of the following abilities: physical, cognitive, mental, technical, and tactical. In some sports, such as sailing and cycling, equipment also plays a decisive role among performance factors.

A deeper understanding of performance outcomes requires the research and analysis of all relevant performance factors. In elite sport, where top-end performance is sought, the above general performance factors are broken down into micro-level factors, in order to polish and perfect the execution of each element. One common way to achieve this process is by the construction of deterministic models, with which main sport skills (i.e., sprint acceleration) are hierarchically analyzed from the final goal of the skill, through contributing factors, all the way to its fundamental elements (Figure 1). These models are then used to identify factors and elements that can be improved by training interventions.

Imagine the following scenario: Two swimmers perform a periodical test composed of six intervals of the 200-meter backstroke; the timed results show very similar performance levels. What type of training program should the coach design for each swimmer’s next training block, based on the test results? Should training focus on the same aspects for both? Is it possible, for example, that one swimmer achieves his/her results based on an average physiological level, but excellent technical execution while his/her peer records a similar performance based on a high physiological level, but mediocre swimming technique? In such a case, should their training program differ one from the other?

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Functional-Biomechanical Profiling Project
Based on the above described approach, at the Israeli Center for Olympic Sports Research,* we designed a method of functional-biomechanical profiling, the goal of which is to identify and test the main biomechanical capabilities underpinning performance in the main skills of each sport discipline.

Our first project was the profiling of explosive strength and stretch-shortening cycle (SSC) capabilities of the Olympic sprinter, Diana Vaisman. The testing protocol, coordinated with her coach Irena Vaisman, took place in the labs of the Technion Biomechanical Center and included the following jumping tests: Squat jump (SJ), Counter-Movement Jump (CMJ), Drop Jump (DJ), and reactivity test (5 repeated jumps for ankle stiffness). Each test identifies different biomechanical properties, essential for different stages of the full 100-meter sprint performance (Figure 2). All tests were performed twice, both bi-laterally and uni-laterally (a total of six repetitions per test). The height of the jump, calculated from time of flight, was used as the performance parameter. The biomechanical measurements included a kinematic analysis based on a full-body model, using a Vicon motion capture system, a kinetic analysis based on a 3-dimensional ground reaction force measurement, using a Kistler force plates, and muscle activity assessment of the main lower limb muscles using a Delsys EMG system.

A preliminary analysis of results indicates that performance ability in the gross motor tests is quite similar between the left and right sides of the athlete’s body. However, a qualitative analysis of kinematic and kinetic curves highlights significant differences in performance strategies: timing and dynamics of force application, relative segmental contribution to overall performance and inter-segmental coordination throughout the movement. One finding, noteworthy at this early stage, is the use of a posterior chain
(hip dominant) strategy on the right side during the SJ, compared with an anterior chain (knee dominant) strategy on the left side. This finding might have implications to critical technical questions such as the selection of the starting leg and the pick-up strategy during the acceleration phase. The next stages of analysis will concentrate on a deeper understanding of segmental dynamics and the contribution (kinetic chain patterns) to the full motion in each test, using methods such as inverse dynamics, to evaluate the quality of the gross motor tools of explosive strength and SSC properties in the athlete’s arsenal.

In the final phase of the project, a detailed biomechanical evaluation of sprint performance in the field will be conducted, using similar materials and methods to those used in the lab testing protocol. The end goal is to provide the athlete and his/her coach detailed information regarding potential targets for improvements through training interventions in both gross motor abilities and in the combined use of these abilities in the athlete’s sprinting technique.

* The Israeli Center for Olympic Sports Research is a strategic scientific-professional collaboration between the Olympic Committee of Israel, The Technion and the Elite Sports Unit at the Wingate Institute
## Achievements

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<tr>
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<th>Place</th>
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THANKS!