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ADVANCING OUR SPORT THROUGH KNOWLEDGE
FAIRE PROGRESSER NOTRE SPORT PAR LA CONNAISSANCE
ПРОДВИЖЕНИЕ НАШЕГО СПОРТА ЧЕРЕЗ ЗНАНИЕ
PROGRESO PARA NUESTRO DEPORTE MEDIANTE CONOCIMIENTO

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The official journal of the International Network of Wrestling Researchers (INWR)

UNITED WORLD WRESTLING

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Cover Photo Credit: Vladimer Khinchegashvili (GEO) over Yianni Diakomihalis (USA), 4-4 at New York Beat the Streets, 2020. Courtesy of Justin Hoch joch.com

International Journal of Wrestling Science

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COVID-19: CONSIDERATIONS REGARDING THE RETURN TO WRESTLING TRAINING

David G. Curby

International Network of Wrestling Researchers
United World Wrestling Scientific Commission

davcurb@gmail.com

Coronavirus disease 2019 (COVID-19) is an acute respiratory disease caused by the Severe Acute Respiratory Syndrome Coronavirus-2 (SARSCoV-2). The World Health Organization (WHO) on March 11, 2020, declared the novel coronavirus (COVID-19) outbreak a global pandemic (Cucinotta & Vanelli, 2020). It has wreaked its havoc world-wide and disrupted almost all aspects of our existence. This includes sport. On 24 March 2020, the International Olympic Committee, the International Paralympic Committee and the Japanese Government formally announced a rescheduling of the Tokyo 2020 Olympic and Paralympic Games 'to safeguard the health of the athletes, everybody involved in the Olympic Games and the international community' (International Olympic Committee, 2020). Training has been stopped or curtailed because of required social isolation. The Coronavirus has turned the Olympic world upside down. Countless athletes made plans to compete in qualifiers and the Games only to have the scheduled events cancelled, postponed or tentatively rescheduled.

The COVID-19 pandemic in 2020 has resulted in widespread training disruption. Some athletes have had access to facilities and equipment, while others have limited or no access, severely limiting their training practices. No doubt that the prolonged isolation training period due to the COVID-19 outbreak has a profound negative effect on the physical capabilities of athletes. As the world begins the slow return to training and competition, there are many considerations that must be taken into account by sporting organizations, governing bodies, medical providers, athletes, and coaches, to name a few.

On return to training, the focus should be on progression of all aspects of training, taking into account the status of individual athletes and must be done with the appropriate physical and psychological preparation. Special attention must be given to athletes who have contracted COVID-19, and will be returning to training.

Following this long absence from training, there will be a significant amount of anticipation and excitement to resume wrestling training. This return to training is prone to a process that is too quick. An accelerated return puts the wrestler at a higher risk for injury. In the context of normal training cycles, a systematic training plan is required to prepare an athlete for the demands of the sport. Proper management of training loads is necessary. Every athlete will return to training having maintained variable levels of wrestling-specific activities and general fitness. Each athlete, during their time away, will have had variable opportunities for recovery and access to care for pre-existing injuries. This necessitates an individualized approach (Kagan et al., 2020)

PHYSIOLOGICAL RECONDITIONING CONSIDERATIONS ON RETURN TO TRAINING:
Restoration of fitness to the pre-COVID-19 levels is of primary importance. Prolonged time away from wrestling, as short as 2-4 weeks, can create a state of "detraining". Although the decreased training load during the initial weeks of lockdown may have had a positive super-compensation and recovery effect, the long-term effects of detraining are detrimental to the training status of elite athletes. Additionally, detraining has a negative impact on muscle activity and range of motion of joints and which can result in a loss of efficiency and fine motor tuning which can lead to small decrements in technique (Mujika & Padilla, 2000a).

It is recommended that coaches and sports scientists should therefore: 1) closely monitor athletes, especially when they start competing again; 2) asses and evaluate the injury risk of each athlete before he/she returns to train; 3) design comprehensive training programs which include endurance and strength components as well as technical and tactical skills training; 4) be selective in choosing events from the competitive calendar; and 5) adopt a flexible training and preparation approach (Lamberts & Gomez-Ezeiza, 2020).

According to Mujika & Padilla, (2000a & b) detraining is the partial or complete loss of training-induced adaptations, in response to an insufficient training stimulus. Detraining characteristics may be different depending on the duration of training cessation or insufficient training. Detraining has been classified as either short term detraining (less than 4 weeks of insufficient training stimulus) and long-term detraining (more than 4 weeks of insufficient training stimulus). Short term cardiorespiratory detraining is characterized in highly trained

athletes by a rapid decline in maximal oxygen uptake (VO_2max) and blood volume. Exercise heart rate increases insufficiently to counterbalance the decreased stroke volume, and maximal cardiac output is thus reduced. Ventilatory efficiency and endurance performance are also impaired. These changes are more moderate in recently trained individuals. From a metabolic viewpoint, short term inactivity implies an increased reliance on carbohydrate metabolism during exercise, as shown by a higher exercise respiratory exchange ratio, and lowered lipase activity, glycogen levels and lactate threshold. At the muscle level, capillary density and oxidative enzyme activities are reduced. Training-induced changes in fiber cross-sectional area are reversed, but strength performance declines are not as great. Hormonal changes include a reduced insulin sensitivity, a possible increase in testosterone and growth hormone levels in strength athletes, and a reversal of short-term training-induced adaptations in fluid-electrolyte regulating hormones.

In a period longer than 4 weeks, the maximal oxygen uptake (VO_2max) of athletes declines markedly but remains above control values during long term detraining, whereas recently acquired VO_2max gains are completely lost. This is partly due to reduced blood volume, cardiac dimensions and ventilatory efficiency, resulting in lower stroke volume and cardiac output, despite increased heart rates. Endurance performance is accordingly impaired. Resting muscle glycogen levels return to baseline, carbohydrate utilization increases and the lactate threshold is lowered, although it remains above untrained values in the highly trained. At the muscle level, capillarization, arterial-venous oxygen difference and oxidative enzyme activities decline, contributing significantly to the long-term loss in VO_2max. Oxidative fiber proportion is decreased in endurance athletes, whereas it increases in strength athletes, whose fiber areas are significantly reduced. Force production declines slowly, and usually remains above control values for very long periods. All these negative effects can be avoided or limited by reduced training strategies, as long as training intensity is maintained and frequency reduced only moderately. On the other hand, training volume can be markedly reduced. Cross-training may also be effective in maintaining training-induced adaptations.

We know that training restrictions and constraints may cause physiological decline. The increased risks are likely to be higher if the time needed to counteract this deconditioning is not granted before returning to competition. This may especially be the case for individuals whose level of training during home confinement has been constrained. Therefore, in deciding how and when to return to competition, it is important that coaches and trainers are aware that their decisions can have health consequences such as increased injury risk.

The lower load or absence of training because of confinement will result in the detraining of certain structures and systems. This can lead to an increased chance for injury and poor performance. Excessive loading upon resumption of training can also lead to injury. Resumption in training must begin with a thorough preparation phase of sufficient duration. This includes with appropriate levels of volume. Excessive volume, insufficient progression, and a sudden increase in the training intensity can negatively impact the wrestlers' assimilation capacity and could result in overload injury.

The balance between short-term training load and long-term training load is critical, with any rapid increases in short-term load leaving athletes vulnerable to injury in the absence of appropriate longer-term load. When these existing risks are combined with limited pre-season preparation, the frequency of injury increases. The most compelling example of this phenomenon was seen in the United States following the 2011 National Football League lockout. This dispute which prevented players from accessing team facilities for 136 days, pre-season training camps were cut from the typical 14 weeks to just 17 days. In the first 12 days of training camp, 10 players ruptured their Achilles tendon and the number of injuries recorded within the first month of the return was more than double the average typically observed over an entire season.

Coaches need to resist the urge to blindly jump straight into regular programming to make up for lost time. Acquiring baseline measures of physical capacities when players return to team facilities should be a priority in order to appropriately assess the damage and evaluate injury risk on an individual basis. Promptly reinstating any training load monitoring processes is also essential, and since tolerance to external load has likely shifted, measures such as heart rate variability and ratings of perceived exertion will be particularly valuable in making sensible load prescription and progression decisions. Importantly, this includes appropriate exposures to general physical preparation as well as skill and tactical training (Impellizzeri et al, 2020; Trackdemic-Blog, 2020; Casais-Martinez et al., 2020).

A dual combat sport like wrestling depends on having an opponent for decision-making that can only be practiced when training with others. Under normal circumstances, athletes would return to structured preparation after a 3- to 6-week off-season and progress to competition over 6–12 weeks. Assuming that wrestlers stayed without wrestling-specific training for ~4-12 weeks and that their workload during that period was about 20-40% of that in the normal competitive period, the recommended time for returning to full training without a high risk of injury is estimated to be 3–5 weeks (Mohr et al., 2020). A general base must be introduced with the gradual addition of specific training with increasing intensity.

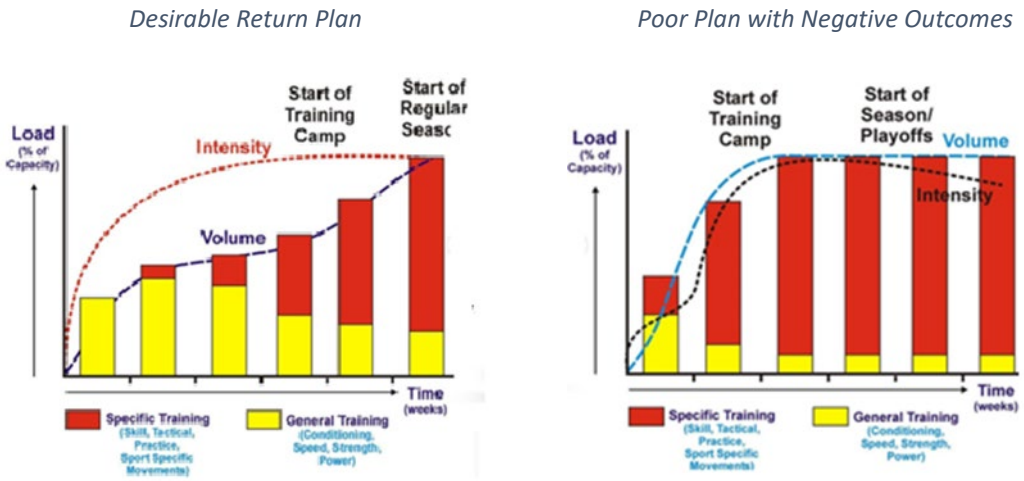

Figure 1. Recommended Loading Plans with Desirable Ratios of General vs Specific Training, Volume and Intensity
(Derek Hansen https://ylmsportscience.com/2020/06/21/managing-the-return-to-sport-after-the-quarantine/)

Training Loads and Susceptibility for COVID-19
Elite athletes can demonstrate relative immune compromise associated with high training load and these factors could increase susceptibility to COVID-19. Further, following relative inactivity there are data linking resumption of training with increased risk of injury, thereby increasing the vulnerability of elite athletes as training resumes. Finally, in addition to training load and volume, stress resulting from poor sleep quality, inadequate nutrition, low mood and ineffective recovery strategies may all negatively impact upon an individual's immune function. (Hamilton et al., 2020). A potential increased risk of illness in periods of high-intensity training is a concern, but mainly in non-competitive recreational athletes. Evidence suggests that elite athletes can continue with high intensity training without a similar increased risk of illness, providing there is no sudden increase in training load (Hull, Loosemore, & Schwellnus, 2020).

Considerations for Female Athletes
Considerations for female athletes may differ from males in several ways. Studies suggest that there are many differences between men and women in the immune response to CoV-19 infection and inflammatory diseases. (Conti & Younes, 2020). Data from China and Italy show that men are more likely to be infected with COVID-19, and are more likely to experience COVID-19-related mortality (70% of the deaths in Italy thus far, were men (Wu & McGoogan, 2020; Remuzzi & Remuzzi, 2020).

A number of underlying causes have been proposed, from lifestyles - men are more likely to smoke, and have comorbidities associated with a greater risk of a worsened outcome from the virus, such as hypertension and diabetes. There are also immunological differences exist between men and women, expressed upon activation with a virus. This has, in part, been attributed to the X chromosome, which appears to have a role in innate and adaptive immunity. More specifically, genes encoded by the X chromosome result in a lower viral load, and less inflammation (Bhopal, & Bhopal, 2020). The Bhopal work holds the view that although the number of male cases is not dissimilar to the number of female cases, men have about twice the risk of death from COVID-19

Bruinvels et al., (2020) emphasize the need to address the specific needs of women athletes as medical personnel monitors their recovery from COVID-19, as well as tracking athletes as they resume training. Among those recommended are resting heart rate and heart rate variability. In menstruating women, it is important to account for physiological changes in basal body temperature and resting heart rate when undertaking daily measurements, as fluctuations in ovarian hormones influence these markers. There is also the potential for menstrual symptoms to be concurrent with COVID-19 symptoms, for example, experiencing achiness, fatigue, nausea and headaches. Tracking menstrual cycles and symptoms alongside temperature, heart rate and potential COVID-19 symptoms would reduce risk of potential ambiguity. Frequent monitoring of resting heart rate, biomarkers of inflammation and oxidative stress, where possible, and menstrual cycle tracking, would further augment athlete care while sport adapts to a new normal and the influence of COVID-19 gradually subsides. They state that history points to a lack of inclusion and consideration of female-specific needs in scenarios such as these, but we have an opportunity to provide parity in athlete care across sport.

Considerations for Young Athletes

Young athletes, generally speaking, represent one of the healthiest and fittest groups in society. Medical providers have wondered how to best counsel athletes with medical conditions that may be associated with increased risk of severe COVID-19, specifically, diabetes, asthma, sickle cell trait (SCT), hypertension, and obesity. The Centers for Disease Control and Prevention (2020a) guidance does not explicitly address young athletes returning to sport but recommends that high-risk individuals of any age take extra precautions, including those with chronic lung disease or moderate to severe asthma, chronic kidney disease being treated with dialysis, diabetes mellitus, hemoglobin disorders, liver disease, serious heart conditions, severe obesity (body mass index [BMI] ≥40 kg/m2), or those who are immunocompromised.

The vast majority of deaths from coronavirus occur in those older than 25 years of age, with those aged 15 to 24 years representing only 0.1% of all deaths (Centers for Disease Control and Prevention, 2020b). Of those younger than 24 years of age who died from the virus, 4% had hypertension, 21% were obese, and 15% had diabetes. Children demonstrate similar prevalence of these conditions, except for diabetes. In the general adolescent population the prevalence rates for hypertension are 4% and obesity, 20.6%, but is much lower for diabetes (0.25%).

Harmon et al., (2020) offer the following guidance for Comorbid Medical Conditions in Young Athletes:

Athletes with diabetes should be counseled regarding the potential for increased morbidity and mortality if infected with COVID-19 and consider delaying return until sports reintegration is confirmed safe and the risk of acquiring a new infection is better understood.

Asthma affects 8.4% of the population from 0 to 17 years of age. Exercise induced bronchospasm is common among athletes, especially during the winter and in endurance sports, but is not known to confer a higher risk of poor outcomes with SARS-CoV-2 infection. Athletes with asthma should be evaluated prior to participation in sports to confirm their treatment regimen is optimized and they are adherent to their medications.

Sickle Cell Trait (SCT) is also common, with 9% of African American/black individuals carrying the gene. Although sickle cell disease and thalassemia are considered by the CDC as higher risk for adverse outcomes with COVID-19 infection, SCT is not. No additional precautions are recommended for returning athletes with SCT; however, if an athlete with SCT contracts SARS-CoV-2, treating physicians should be vigilant for issues related to hypercoagulability both during the acute illness and for several months into recovery. This includes allowing adequate acclimatization and reconditioning while optimizing hydration, minimizing heat stress, and avoiding blood flow restriction devices used for rehabilitation and strengthening.

Obesity, with data often represented by body mass index (BMI) has shown an increased association of poor COVID-19 outcomes with higher BMIs and one study found this to be true especially in younger patients with BMIs ≥30 kg/m^2, and even more so among those with BMI ≥35 kg/m^2 (Lighter, Phillips & Hochman S, 2020). While most athletes are fit, many sports recruit athletes with a larger build, particularly American football lineman or the heaviest classes in wrestling. The CDC groups people with severe obesity (BMI ≥40 kg/m^2) as potentially at risk for severe illness, although the literature associated with COVID-19 employs variable definitions of obesity, some including those with BMI ≥25 kg/m^2. BMI is intended to be a marker of excess fat but may not be a good measure in athletes, as lean muscle mass is typically increased with lower percentages of body fat. As in the general population, those with higher BMI are also more likely to have other comorbidities such as hypertension or diabetes.

Preparticipation guidance for all athletes should include a discussion of risks of SARS-CoV-2. The risk of poor outcomes in those younger than 25 years of age remains low, and youth and high levels of fitness may effectively mitigate the risk of severe COVID-19 outcomes in athletes with pre-existing risk factors (Harmon et al., 2020; Toresdahl & Asif, 2020)

SPECIAL CONSIDERATIONS FOR TRAINING AT ALTITUDE

Many athletes will look to plan at least one altitude training camp in the next 12 to 18 months. During these altitude training camps, athletes will be required to manage changes in training load and to stay socially close to other athletes. Athletes will face physiological adaptations to altitude, and hypoxia-induced stress on the pulmonary, cardiovascular, renal and immune systems that may be exacerbated by prior exposure to COVID-19. Altitude training may also lead to greater susceptibility to COVID-19 infection and its sequelae by increasing the level of hypoxemia and further depressing immune function. It is recommended to adopt specific cautions before, during and in return from altitude exposure. In particular, early symptoms of maladaptation to hypoxia, and respiratory problems should be considered with attention as they can mask COVID-19 symptoms. Specific recommendations for altitude training programming are needed to preserve athletes' health in this post COVID-19 environment (Manferdelli et al., 2020).

PSYCHOLOGICAL CONSIDERATIONS

Sport psychologists report a higher demand for online psychological counseling and diagnosis of psychological disorders among these athletes during the pandemic, including fear of being infected, anxiety of physical recovery if infected, lack of access to fitness centers, disturbed sleep, eating disorders, obsessive-compulsive disorder, and family conflicts. Inability to manage stress and lack of proper coping may lead some to experience short- or long-term depression (Mehrsafar, Gazerani, Zadeh, & Jaenes Sanchez, 2020).

With many events and competitions postponed indefinitely, with no certain confirmation of when some will resume, this is likely to cause a significant amount of stress for athletes. If you struggle to cope with stress, over time it is likely to have a negative impact on mental health, especially if athletes do not seek support or begin to take proactive measures to manage their well-being (Breslin, 2020).

Cancelled events such as World Championships or Last Chance Qualifiers can be a devastating loss to athletes who have trained years to compete or still need to qualify for the Olympics. Some may be wondering if their Olympic dreams are over. Athletes may experience pain similar to a death or an intense life loss.

Wrestlers can be susceptible to the consequence of increased stress due to the inability to train, potential health risks and employment security, and further decreases in physiology due to lack of sleep, poor nutrition and non-planned exercise. There is a potential to have elevated inflammation due to emotional stress/uncertainty and resultant links to injury and illness onset. A survey of athletes aged 18 to 30 indicated that the athletes were mentally exhausted and depressed because of uncertainty of what their future performances will be (Thomas, 2020; Noori, 2020).

The training limitations arising from COVID-19 present a number of psychological considerations that may influence preparation for, and subsequent return to, competition. These include the impact of confinement and isolation, deconditioning effects, deterioration in skill execution/performance, and, the opportunity for recovery and posttraumatic growth.

In addition to the psychological effects from periods of confinement and isolation reported in the general public, such as post-traumatic stress symptoms (i. e. depression, anxiety, confusion and anger), athletes may be at further risk due to the impact on their athletic identity. Athletic identity refers to the extent to which an individual identifies with their role as an athlete. Any challenges to the ability to reinforce this identity through reduced capacity to train, play and achieve goals (typically seen in injured or retired athletes) are associated with feelings of loss, identity crisis and distress. Engaging with social support networks is seen as a key resource to cope with potential threats to athletic identity.

There is limited research has examined the psychological effects of a period of detraining or rest. While acute bouts of rest (e. g. 2-week mid-season break) improve subjective perceptions of some aspects of wellness, such as fatigue and muscle soreness, an abrupt cessation of training by highly trained athletes creates a phenomenon known as detraining syndrome, characterized by insomnia, anxiety, depression, alterations to cardiovascular function, and loss of appetite. These symptoms are usually not deemed pathological and can be reversed, if training is resumed within a short time; however, with prolonged cessation, symptoms may become more pronounced.

In considering the human trauma associated with COVID-19 it is noteworthy that the consequences for mental health and well-being will not be inherently negative. Potential exists for growth in response to traumatic life experiences, where growth involves profound and transformative positive changes in cognitive and emotional life that are likely to have behavioral implications. Both individual and collective psychological growth may be derived from the trauma and adversity athletes, teams and their staff face during the restrictions. The extent to which growth is likely to occur will, however, be influenced by the amount and nature of the support provided before, during, and after the restrictions. In order for an athlete to return to action, he/she must feel psychologically ready to face the new reality. Before returning to team training, a meeting with the coach and / or sports psychologist is suggested, in order to discuss any questions, concerns and peculiarities the athlete has. Coaches should give continuous reminders to the athletes of the initial reasons for engaging in the sport: fun, friendship, healthy competition, and creating a healthy body.

Both coaches and psychologists should intervene at both the individual and team levels to ascertain the level of anxiety and psychological strain. Help the athletes come back to the present, using breathing and cues to come back to center. Stick to your training plan for the next event. Train like competitions are still going to happen. However, separation of external, long-term goals such as participation in a world championship and winning medals, from short-term, internal goals such as, increasing muscular power, improving body composition, or mastering a new technique can be useful. View the changes as an adventure; the unknown is a challenge to be faced (USOPC, 2020; Stokes et al, 2020).

A high level of awareness is required by all support personnel interacting with athletes at this time. Atypical behavior, lack of engagement, loss of motivation, as well as physical changes such as loss of appetite and poor sleep, may all indicate a change in mental state. In addition to maintaining a high level of vigilance for mental health issues, medical practitioners, working closely with psychologists should consider the use of brief mental health assessments. The use of general well-being data (including sleep quality, mood, energy), often collected and collated by a range of disciplines within elite sport, should be used through-out the COVID-19 pandemic. In collaboration with the relevant psychologists, medical practitioners should have an established protocol for reviewing well-being data throughout this period (Hamilton et al., 2020)

AT RISK GROUPS FOLLOWING PERIOD OF TRAINING RESTRICTION

Wrestlers with history of previous injuries or illness: This due to their higher reinjury risk during early sport reintegration. There are also greater residual biomechanical and neurological deficits due to previous injury history. Not being able to access rehab treatment as normal requires assessment and reconditioning by therapists as needed.

Wrestlers who had a COVID-19 infection: Due to possible long-term effects on respiratory and cardiovascular system and potential altered capacity may result in a reduced ability to train effectively on return. Do not share the names of sick athletes unless there is a compelling justification (requested by health authorities, for medical reasons). Ensure privacy rules are respected.

The high inflammatory burden in COVID-19, described as a hyperinflammatory response, is considered to be co-responsible for development of acute respiratory distress, vascular inflammation, myocarditis, and myocarditis-related cardiac events, e.g. arrhythmias. (Schellhorn, Klingel & Burgstahler, 2020). In athletes recovering from COVID-19, even without pre-existing diseases, the development of cardiovascular complications and long-term consequences, e.g. arrhythmias, must be taken into consideration and should be ruled out by means of a medical careful follow-up. In the near future, data about treatment and monitoring of athletes recovering from COVID-19 will be of major importance. The questions of eligibility for sport and long-term consequences of COVID-19 for athletes should be addressed in concert with the medical support team. A conservative approach rather than an accelerated return would be prudent until more evidence emerges. The significance of such findings for optimal human performance is uncertain at this stage and warrants further longitudinal investigation. Although COVID-19 is novel, there have been previous outbreaks of CoV SARS. A prospective cohort study of 94 SARS survivors reported persistent pulmonary function impairment in around a third of patients at 1-year follow-up (Barker-Davies, O'Sullivan, Senaratne, et al., 2020).

Athletes who are returning to the training environment from isolation due to suspected or confirmed cases of COVID-19 or other COVID-19 related reasons must do so under the direction of a physician/medical officer, familiar with the emerging evidence related to post- COVID-19 pathology and following the most up to date return to training steps. For recovered individuals ready to resume training, it is recommended that a careful, clinical cardiovascular evaluation in combination with cardiac biomarkers and imaging. With no symptoms and no objective evidence of cardiac involvement, a return-to-exercise training with close clinical follow-up would be reasonable. If testing suggests cardiac involvement, return to play should be based on myocarditis return-to-play guidelines. (Phelan, Kim, & Chung, 2020; Gov.UK, 2020).

CARDIAC INVOLVEMENT

Cardiac evaluation is of utmost importance due to the direct complications of the disease. In the presence of any positive and in those with serious COVID-19 infection, the management should be similar to other cases of myocarditis, with a further work-up including cardiac magnetic resonance, implantable looping recorders, among others). If the diagnosis of myocarditis or myopericarditis is established, a period of disqualification (3–6 months) is needed, according to the clinical severity and duration of the illness. After this period, it is reasonable to resume training and competition if left ventricular systolic function has returned to the normal range, serum biomarkers of myocardial injury have normalized and clinically significant arrhythmias such as frequent or complex repetitive forms of ventricular or supraventricular arrhythmias are absent on 24-hour Holter monitoring. While COVID-19 myocardial injury, as defined by increases in circulating cardiac troponin levels, has been described in up to 28% of the sickest of patients, its prevalence and clinical implications among infected people who experience mild illness or who remain asymptomatic remains completely unknown. Further, the incidence of silent myocardial inflammation that lingers long after the resolution of typical COVID-19 symptoms, a form of disease that may uniquely affect athletes during resumption of training and competition, is also completely unknown. (Dores, & Cardim, 2020). In some cases, cardiac involvement occurred even in patients without symptoms and signs of interstitial pneumonia, reinforcing the importance of subclinical cardiological investigation and measurement of cardiac biomarkers (Inciardi et al., 2020).

Numerous medical and sporting organizations are developing comprehensive strategies to ensure a safe return to training and competition. This is a complex process that will require a multidisciplinary, team-based approach that balances priorities surrounding athlete health with strategies to protect the general public from further spread of the infection. Ensuring the health of athletes will involve continued strategic use of physical distancing, widespread dissemination of COVID-19 antigen and antibody testing, the use of electrocardiography or blood biomarker testing to screen for occult myocardial injury and inflammation, and definitive diagnostic and therapeutic strategies for those deemed at highest risk. Evidence is limited, and conclusive recommendations regarding these issues will require ongoing research and monitoring of athletes afflicted with COVID-19 (Baggish, Drezner, Martinez, & Prutkin, 2020).

A German study evaluated the presence of myocardial injury in unselected patients recently recovered from COVID-19 illness. In this prospective observational cohort study, 100 patients recently recovered from COVID-19 illness were identified from the University Hospital Frankfurt COVID-19 Registry between April and June 2020. A total of 78 patients recently recovered from COVID-19 (78%) had abnormal CMR findings. CMR revealed cardiac involvement in 78 patients (78%) and ongoing myocardial inflammation in 60 patients (60%), independent of preexisting conditions, severity and overall course of the acute illness, and time from the original diagnosis. These findings indicate the need for ongoing investigation of the long-term cardiovascular consequences of COVID-19 (Puntmann et al., 2020).

Months after recovering from COVID-19, some college athletes are showing signs of heart inflammation brought on by myocarditis that may be linked to SARS-CoV-2 exposure. When they imaged the hearts of more than two dozen of Ohio State University players using cardiac magnetic resonance (CMR), they found evidence of myocarditis in 15 percent, while a further 30 percent had cellular damage or swelling that could not be linked definitively to the condition. (Rajpal et al., 2020)

To assess the presence of myocarditis in college athletes that have recovered from COVID-19, the Rajpal study selected 26 students at Ohio State University, including men and women. None of the participants, who played football, soccer, lacrosse, basketball, or track, had previous heart conditions before being tested. 26 participants had contracted the coronavirus between June and August and had their cases verified using a PCR test. The timing between their diagnosis and their subsequent testing for myocarditis varied between 11 days to almost two months. Twelve of the athletes reported mild symptoms while sick, while the rest were asymptomatic.

Ordinarily, athletes may have their heart health assessed using a battery of tests: a physical examination, an ultrasound, an electrocardiogram, and a blood test to measure for the heart stress protein troponin I. The current study included all these tests, but also added the cardiac magnetic resonance imaging (CMR), which the authors say was the most successful tool at identifying cases of myocarditis.

A leading position paper paper suggests before returning to competitive sports, athletes who initially present with an acute clinical syndrome consistent with myocarditis should undergo a resting echocardiogram, 24-hour Holter monitoring, and an exercise ECG no less than 3 to 6 months after the initial illness.
(Maron et al., 2015)

The response of the Big Ten Conference regarding American football provides an example of the difficulties administrators face to ensure the safety of athletes in light of the many unknowns of COVID-19. After originally canceling the season because of uncertainty over myocarditis, the administrators reversed their decision following a proposal that included strict medical screening and tracking, particularly those athletes who had tested positive for COVID-19.

This plan calls for all COVID-19 positive student-athletes to undergo comprehensive cardiac testing to include labs and biomarkers, ECG, Echocardiogram and a Cardiac MRI. Following cardiac evaluation, student-athletes must receive clearance from a cardiologist designated by the university for the primary purpose of cardiac clearance for COVID-19 positive student-athletes. The earliest a student-athlete can return to game competition is 21 days. Following a COVID-19 positive diagnosis. In addition to the medical protocols approved, the 14 Big Ten institutions will establish a cardiac registry in an effort to examine the effects on COVID-19 positive student-athletes. The registry and associated data will attempt to answer many of the unknowns regarding the cardiac manifestations in COVID-19 positive elite athletes. If an athlete who gets COVID-19, and then shows indications of myocarditis, then they are out for the season.

All COVID-19 positive student-athletes will be required to undergo cardiac testing and must receive clearance from a university-designated cardiologist for the “primary purpose of cardiac clearance for COVID-19 positive student-athletes, with 21 days the earliest a student-athlete can return to competition. (Big Ten Conference (2020, September 16)

Return to Play Guidelines and Algorithms

Various organizations have developed recommendations for return to play plans. Figure 2 is a schematic from the UK.

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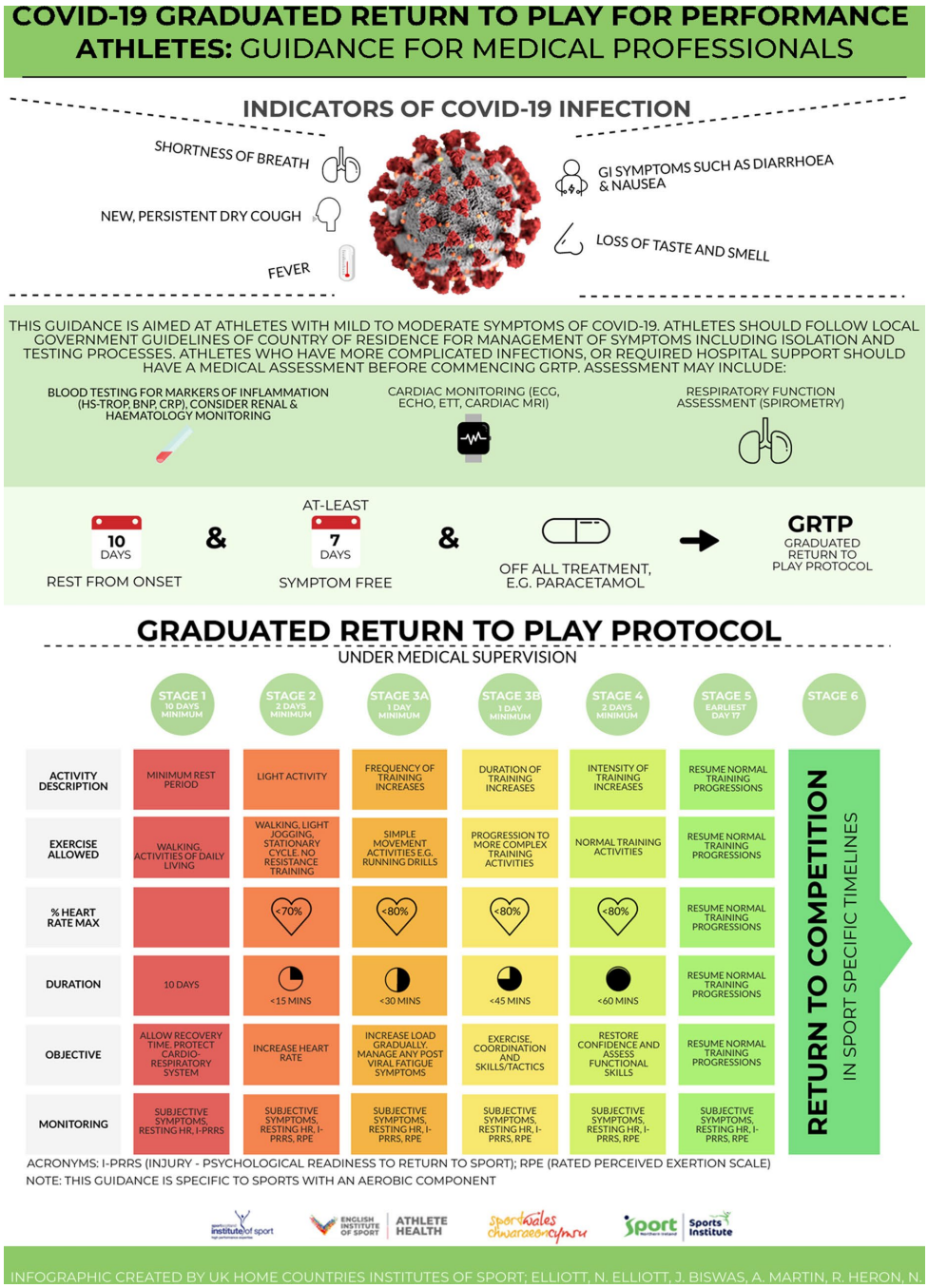

Figure 2. Infographic. Graduated return to play guidance following COVID-19 infection. (Elliott, 2020).

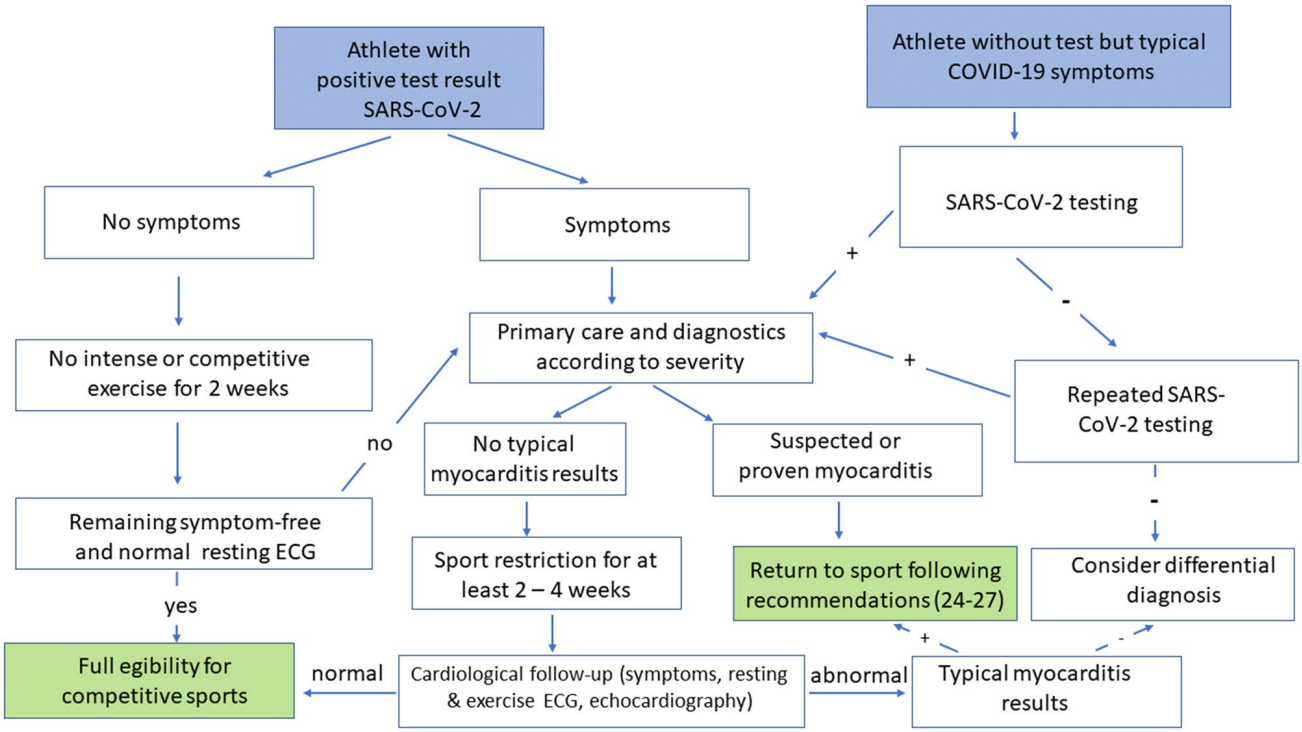

Figure 3. Proposed algorithm for a return to sport for an athlete with positive test result of SARS-CoV-2 or with typical COVID-19 symptoms. Schellhorn, P., Klingel, K., & Burgstahler, C. (2020). Return to sports after COVID-19 infection. Eur Heart J. doi:10.1093/eurheartj/ehaa448

The return to sport recommendations in Figure 3 are based on work by the European Society of Cardiology, the American Heart Association/American College of Cardiology, or the 36th Bethesda Conference. Whether this approach is also applicable in COVID-19-associated myocarditis is presently unclear. Similar return to play plans have been advanced by Oikonomou et al., (2020); Hughes et al., (2020) and Löllgen et al. (2020).

Return to Play for Children and Youth

The American Academy of Pediatrics offers guidelines for youth athletes (Wyckoff, 2020) Youths who have recovered from COVID-19 should be cleared for a return to sports by their physician and undergo evaluation for cardiac symptoms such as chest pain, shortness of breath, fatigue, palpitations or syncope. A positive cardiac screen or other concerning findings should prompt an electrocardiogram (EKG) and potential referral to a pediatric cardiologist, according to AAP recommendations. All patients who have been infected with SARS-CoV-2 or with exposure to SARS-CoV-2, regardless of symptoms, require a minimum 14-day resting period and must be completely asymptomatic for greater than 14 days before returning to exercise and/or competition. They also should be cleared for participation by their primary care physician. Any COVID-19-positive individual who has a history of or current cardiac symptoms or has any cardiac findings on examination is recommended to seek cardiac clearance by the primary care physician, who is encouraged to collaborate with a pediatric cardiologist as necessary prior to participation. Parents need to report if their athlete or a household contact is exhibiting signs or symptoms of COVID-19 or tests positive for SARS-CoV-2, even if asymptomatic. Although children and adolescents play a major role in amplifying influenza outbreaks, this does not appear to apply to SARS-CoV-2. While questions remain, most evidence shows children under age 10 years may be less likely to become infected with SARS-CoV-2 and pass it to others. Those older than 10 years, however, seem to spread it as efficiently as adults.

Return to Play Schedules and Sport Risk Stratification

The chief medical officers of many of the major Olympic, Paralympic and Professional Sports in the UK formed a group to share thinking around how elite sport might best plan for a return at the appropriate time using the following stages:

1 Training-individuals or groups of individuals training, but adhering to social distancing
2 Training-team or group
3 Competition-domestic and no spectators
4 Competition-cross border and no spectators
5 Competition-no restrictions and spectators present (Kemp et al., 2020)

Guidelines put forth by Jonathan Finnoff, the Chief Medical Officer of the United States Olympic and Paralympic Committee, in a letter to national governing bodies, includes risk stratification by sport. Selected excerpts are included here: Although there are not yet any specific scientific studies evaluating the risk of COVID-19 transmission in sport, it is logical that certain sports will have a higher risk than others. Furthermore, since COVID-19 can result in critical illness or death, consideration of the inherent risk associated with different sports should be part of the planning process. The following is a proposed risk stratification scale for COVID-19 transmission in sports:

i. High Risk: sports that involve close, sustained contact between participants, lack of significant protective barriers, and high probability that respiratory particles will be transmitted between participants

Examples: wrestling, boxing, judo, karate, taekwondo, rugby

ii. Moderately Risk: sports that involve close, sustained contact, but with protective equipment in place that may reduce the likelihood of respiratory particle transmission between participants OR intermittent close contact OR group sports OR sports that use equipment that can't be cleaned between participants

Examples: bobsleigh, doubles luge, multi-person rowing, multi-person kayaking, multi-person canoeing, basketball, volleyball, baseball, soccer, water polo, gymnastics (if equipment can't be sufficiently cleaned between competitors), hockey, table tennis, tennis, swimming relays, synchronized diving, pole vault, high jump, long jump, artistic swimming, badminton, fencing, cycling in a group, running in a group, triathlon, modern pentathlon, group sailing, cross country skiing, biathlon, Nordic combined, short track speedskating, speed skating in a group.

iii. Low Risk: sports that can be done with social distancing or individually with no sharing of equipment or the ability to clean the equipment between use by competitors

Examples: Archery, shooting, individual running events, individual cycling events, individual swimming, individual canoeing, individual kayaking, individual rowing, individual diving, equestrian dressage or eventing, golf, individual sailing, skateboarding, sport climbing, trampoline, weightlifting, alpine skiing, single luge, curling, freestyle skiing, individual speedskating, snowboarding, ski jumping.

iv. High risk sports should be avoided until risk mitigation measures can be performed that eliminate the risk of COVID-19 transmission between competitors. Potential ways this could be accomplish include:

Determining that no competitors participating in the event has COVID-19 by:

a. Isolating each athlete for 14 days prior to the competition and ensuring they don't develop any signs or symptoms of COVID-19, OR
b. Having two negative COVID-19 tests 24 hours apart within a few days of the competition and ensuring the athletes are isolated from the time of the tests until the competition.

(Finnoff, 2020)

Emerging Wrestling Competitions

We have seen a gradual return to sport around the world. Some of the first were European football leagues. We have seen professional golf, UFC, NBA Basketball, Major League Baseball and NFL Football resume in the USA with large amounts of testing. During the month of October there are numerous national championships being held in wrestling. Two are described with the COVID-19 protocols put in place.

USA Wrestling recently conducted its National Championships, October 9-11. Fans were allowed with approximately one half of the 5,000 seats were made available through ticket sales.

- Personal Protective Equipment was required
- Every person entering the venue was subjected to a daily screening (Athletes, Coaches, Spectators, Staff, Officials, Medical, Media…etc.) This included a temperature check as well as an event questionnaire form. Anyone with a fever of 100.4 degrees Fahrenheit or higher was escorted a controlled medical area where the medical director can do an evaluation of their symptoms.
- People were not allowed congregate and should avoid other groups that are leaving the venue from the prior session.
- Signage to direct traffic flow around the venue to maintain social distancing.
- Floor markings were taped, showing between athletes waiting for competition.
- Athletes, coaches and spectators will be expected to ensure 6 ft. between themselves and any others waiting.

- Only one coach was be allowed to sit in the athlete's corner throughout the duration of the match.
- Coaches will also be required to wear a face covering at all times in the venue.
- Athletes were required to wipe themselves down with their own personal towels/wipes before the match, in between periods and after the match.
- When athletes are not competing, they will be required to wear a face covering while inside the venue.
- All officials should wear face coverings and/or shields during the match.
- Officials should sanitize before and after each match.
- A strict no handshake policy will be observed for customary wrestling-related activities such as pre-match and post-match handshakes between athletes, coaches and officials.
- Everyone should practice proper hygiene, wash hands frequently with soap and water for at least 20 seconds, use hand sanitizer, refrain from touching their face, refrain from spitting, and cover their cough or sneeze with a tissue and throw tissue in the trash.
- A post-event survey will be emailed after the event (7-14 days), in order to get data and information for COVID-19 signs and symptoms.

According to Professor José Maria Lopez-Guillon, member of the United World Wrestling Scientific Commission, the first Spanish National Championships to be held since the onset of the COVID-19 pandemic will be held on October 17. This return to competition will follow protocols used by the National Basketball Association used in their re-launch, that attempt to minimize the risks for all participants. It will include:

- Pre-departure COVID testing of all participants.
- Transportation to destination with protective and distancing gear.
- Concentration of all competitors in same hotel with competition bubbles and where the Championship will be held.
- Medical check and antigen test for discriminatory screening.
- Unidirectional circulation across all areas.
- Mandatory mask wearing in common areas.
- cleaning hands every use.
- Competition room without spectators and with less than 60 people in the arena.
- Outdoor warm-up area and with bout order visible.
- No contact during presentation of awards.

(Lopez-Guillon, personal communication, October 6, 2020)

United World Wrestling Executive Committee has approved existing plans to host the 2020 Senior Wrestling World Championships December 12-20 in Belgrade, Serbia. The committee approved the championships after receiving commitments from more than 70-percent of National Federations, a participation hurdle it had set for itself last month. The bureau will meet November 6th to discuss any changes to the event due to the ongoing coronavirus pandemic and its impact on participation. "We are cautiously optimistic about wrestling's return in December," said United World Wrestling president Nenad LALOVIC. "The safety of our athletes, coaches, and staff is our top priority and we will be taking every measure to ensure that happens in Belgrade."
(United World Wrestling, 2020, October 12).

The world has learned a great deal in a rather short time about the virus SARSCoV-2 and the disease COVID-19. However, how we deal with COVID-19 is still full of unknowns and uncertainty, and almost daily there is new knowledge shared by researchers from around the world. Those of us in wrestling must remain committed to keeping abreast of of these developments, so that we can move forward using best known practice to keep our wrestling community safe and moving forward.

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LOCAL VARIETIES OF OLYMPIC WRESTLING - MONGOLIA

Connor Q. Malloy

Institute of East Asian Studies (INEAST), University of Duisburg-Essen
Duisburg, Germany

connor.malloy@uni-due.de

ABSTRACT
As a category, wrestling refers an eclectic mix of physical activities featuring a wide range of rules, aims, and histories. This broad, sprawling category is generally accepted and supported; Olympic wrestling's international governing body (UWW) states its first goal as: "to encourage the development of all Wrestling styles and to promote the Sport in all countries of the world" (UWW website). Approaching wrestling in this way makes it highly inclusive by extending its base to regions where the Olympic styles are far less common. Furthermore, this outreach supports the narrative that 'wrestling is everywhere,' which is powerful, because it not only spans across geography and culture, but also history. However, despite the relevance and weight of this narrative, not enough attention has been given to examining points of interaction and overlap between the Olympic styles and the so-called traditional styles. Based on qualitative data collected in Mongolia, the present article argues that significant, tangible linkages exist between *bukh* (Mongolia's national wrestling) and the Olympic styles, which contribute to shaping how these distinct styles are experienced by athletes and coaches. Specifically, it investigates how concepts rooted in *bukh* are hailed in the Olympic styles and in this process these concepts are subsequently extended to accommodate new spheres of wrestling experience.

Key Words: traditional sport, Mongolian wrestling, Olympic wrestling

DISCLAIMER
This article is based on data collected as part of the "Raising Champions Project," which was funded by the United World Wrestling (UWW) between October and December 2019. The author of this article is solely responsible for the content thereof.

In a recent special issue of *The International Journal of the History of Sport,* Bromber et al. (2014) put together a number of excellent case studies that reframe how so-called 'traditional' wrestling styles are set in relation to the sportification process, but also processes of modernity. They argue (Krist, 2014 in particular and in relation to *bukh*) that the contemporary version of these traditional or modified sports are often the product of sometimes careful and sometimes overt (re)traditionalization. Furthermore, they feature many of the same characteristics attributed to 'modern' sports, like marketization and branding, and performances are often closely tied to political ideational agendas. With these contributions in mind, an important avenue that has not yet been investigated is how the Olympic styles are themselves often woven into local contexts and straddle the tensions and linkages between 'modern' and 'traditional' sports. This is not to suggest a (re)traditionalization of Olympic wrestling, but rather to recognize that it too is experienced and engaged at both local and transnational levels, each with its own set of norms and practices.

This approach runs against the grain of what one observes at Olympic wrestling competitions, which, like other Olympic sports, are highly standardized and regulated. From the competition format, to the uniforms (at most international competitions athletes' names and countries are written using the Latin alphabet as opposed to Chinese or Arabic script, for example), to the pre- and post-match practices (referee-inspection and hand-shaking) this field of play is relatively closed off from external, and especially local references. However, competitions only comprise a portion of athletes' experience with the sport. A much larger portion is spent off the mat, where wrestling's social, cultural, and economic significance is handled. It is these 'off-mat' variables that can, upon examination, elucidate examples of local embeddedness in what is otherwise treated as an international sport.

Research for this project was conducted over three weeks in Mongolia in 2019. The majority of interviews were held in the capital, Ulaanbaatar (UB), but also in Erdenet and Zuunmod. Semi-structured interviews were conducted with twenty-six individuals, including athletes, coaches, scholars, ministry officials, and school directors. Save for a handful who spoke sufficient English, the majority of interviews were conducted through a translator. Participants were contacted through two different avenues. The first, which accounts for the majority

of interviewees, is the Mongolian Wrestling Federation. The federation facilitated direct contact with national team coaches, national team athletes, retired coaches and athletes, and sports schools in Erdenet and Zuunmod. Another, smaller group of contacts were accessed through an informal international wrestling network, which in this case mostly involved Mongolian athletes who have gone through the US collegiate wrestling system.

One obvious shortcoming with regard to the data sample is an emphasis on urban sites. The division between urban and rural is particularly stark in Mongolia and this distinction likely influences how wrestling is experienced and organized in the hinterland as compared to the capital. Approximately half of Mongolia's population is concentrated in Ulaanbaatar, which is the political, commercial, and industrial center. On the other hand, to some degree the study's urban focus is justified given that the national wrestling federation is based in Ulaanbaatar and practically all elite athletes relocate to the capital at one point or another. Migration to the capital is common across society, and has increased over the last several decades due to a number of factors including climate change, limited social services in the country, unsustainable pastoral practices, and land reforms (Mayer, 2016; Barcus, 2018). For athletes, relocating to the capital is relevant for training purposes, as well as for education and pursuing a career.

Freestyle wrestling in Mongolia

Since its introduction in Mongolia in the 1950s, Freestyle wrestling has been closely connected to Mongolia's national wrestling (referred to hereafter as *bukh),* which was and continues to be Mongolia's most popular sport. *Bukh* competitions have an open weight-class, are held either outdoors on grass or in a carpeted arena, and Bouts are decided when one wrestler is thrown to the ground or touches it with one of his knees or elbows, or his torso. Athletes wear boots, briefs, and jackets tied at the front with a string that can be gripped by the opposing wrestler. In general, only males compete in *bukh.* Zeveg Duvchin, a now retired national team coach who wrestled in the 1970s and whose brother won an Olympic silver medal, suggests that Olympic sports like wrestling and judo were promoted by the then socialist government as modern extensions of *bukh* and in the context of the Cold War, athletic success on the international stage symbolized national strength (*interview, UB, 16.10.2019*). However, these 'modern' sports never replaced *bukh* and even lightweights who are highly disadvantaged by the open-weight class continued to compete in both styles.

Mongolia's 'golden era' of Olympic wrestling began with Jigjidiin Mönkhbat's silver medal in Mexico City in 1968 and closed with Davaajav and Uyuunbold's silver and bronze, respectively, in Moscow in 1980. Among the eight medalists in this period, Jigjidiin Mönkhbat and Khorloogiin Bayanmönkh both went on to win the *Naadam* festival (the largest *bukh* competition) several times, each. The *Naadam* is a massive annual event, which features Mongolia's three 'manly games'. The *bukh* portion of the competition can have 512 to 1024 athletes, depending on the year. Since each match is decided by a single take-down, champions must give a near perfect performance through eight or nine rounds of competition. Mongolia's early success at the Olympics was no doubt driven by an existing pool of experienced *bukh* wrestlers, but in turn, the success that Olympic wrestlers and judo athletes had at *Naadam* also encouraged a multidisciplinary approach to *bukh.*

Although *bukh* is a strictly male event at *Naadam*, children often grow up wrestling one another, regardless of gender, especially in the countryside. The introduction of Olympic wrestling and judo therefore presented an opportunity for women to continue to wrestle in a formal and competitive environment. It should also be noted that in general, Mongolian society is highly supportive of its female wrestlers and their success is perceived as rooted in Mongolia's wrestling tradition. An example of this, though correlational, is that the most popular boys name is Bat-Erdene, after Badmaanyambuugiin Bat-Erdene, the eleven-time *Naadam* champion, the most popular girls name, especially in the countryside is Battsetseg, after Battsetseg Soronzobold who won a bronze medal in wrestling at the London Olympics.

At present, *bukh* has significantly more public interest, resources, and offers greater financial incentives for athletes than Olympic wrestling. In addition to prize money and club salaries, *bukh* sponsorships can be lucrative for the top athletes. Other 'under-the-table' opportunities also play a role, like accepting bribes to throw a match deep in the *Naadam* tournament which can earn one a new car or a cash equivalent. Among Olympic wrestling athletes, the top competitors benefit from several funding schemes, such as national team salaries, club salaries, as well as generous state bursaries and salaries for Olympic and world medals. Additionally, they may also receive gifts and sponsorships from companies, yet these often depend, at least in part, on personal connections. However, some athletes feel funding for their sport is lacking, especially in comparison to *bukh.* Even world medalists personally expressed frustration that Olympic wrestling, especially women's wrestling, is overlooked by private sponsors in favor of *bukh.* A recent government program offers a lifetime salary for world and Olympic medalists, plus one-off bursaries that are shared between the athlete and the coach. These certainly provide a greater degree of financial security for Mongolia's top athletes, however only a few receive them.

One athlete who competed at the world championships a few years ago and at the time of the interview was training both freestyle and *bukh* put it simply, "*bukh* is where the money is… It is professionalized and politicized" (*Interview*, UB, *04.10,2019).* In a later conversation he also elaborated on how *bukh's* politicization plays out in practice:

Coaches, who are normally the owners of clubs, go to politicians and companies, or they come to the coaches, and get or give money for the athletes. Athletes might also get individual sponsorships…they are also expected in some cases to go to rural areas and promote certain politicians […] People who live in the countryside might not know anyone who is a world champion freestyle wrestler, but they will know mid-level national wrestlers […] Every time a wrestler goes to compete the announcer calls his name, his region, his club, and his sponsors. So, there is a lot of name recognition. There are also four tournaments a month, and lots all over Mongolia (*interview, UB, 10.10,2019)*.

Regarding the role of politics in sport, the connection between sport and the concept of the nation-state has been well borne out in the literature (Houlinhan, 1997; Bairner, 2015; Lu & Hong, 2013). In the case of national wrestling styles around the world, the symbolism is perhaps even more compelling than in other events, as wrestlers both figuratively and literally embody strength and tradition (Alter, 1993; Krist, 2014). This image of 'wrestler as the nation' is especially relevant in Mongolia, where many wrestlers move into politics following their athletic career. On this topic, a *bukh* scholar at the Avarga University in Ulaanbaatar suggested that the connection between politics and wrestling in Mongolia is historical and cultural. This link traces back to Chinggis Khan and the khans that followed, who would appoint wrestlers to high political and military positions (*Interview*, *UB, 16.10.2019*). He clarified that (*bukh*) wrestlers are, and have always been highly respected by Mongolians and believed to have strong character in addition to strong bodies. He also mentioned a custom that when a boy is born, people will always with that it becomes a wrestler. This moral ascription echoes findings by Krist (2014) and Mikkola (2019) that wrestlers, or more specifically, wrestling success, has spiritual and ethical dimensions.

The Olympic styles benefit from their connection to *bukh* and are certainly included in a broader notion of Mongolia's wrestling culture. Focusing on a few of the practical boundaries and exchanges between the two styles is important, but it fails to capture the nuances and tensions relating to how the Olympic styles relate to *bukh* from a cultural perspective. In order to begin to approach this issue, the ways in which individuals frame their experiences must also be taken into account.

Recognizing local linkages

That Olympic wrestling and *bukh* training often takes place under the same roof and among the same people is significant in itself. Influences from one style to the other are inevitable in this situation and athletes, both male and female, attest to the existence of a 'Mongolian style' of Olympic style wrestling that has its roots in *bukh.* A female national team athlete described her own wrestling as characteristic of Mongolian style, which is "the art of upper body wrestling" as it emphasizes upper body throws and attacks (*interview, UB, 11.10.2019*). Conversely, a heavyweight U23 World bronze medalist, noted how Olympic wrestling has improved his *bukh* by developing his speed and positional awareness and that participating in international competitions provides an important mental edge and 'feel' that he can bring to *bukh* tournaments (*interview, UB, 14.10.2019)*. Occasionally coaches will combine the two styles in training by mixing the uniforms and rules. In this case, this mixed training is truly an example of hybrid wrestling, as athletes are likely experienced in both styles.

While these trans-discipline dynamics are interesting, what is more relevant to the notion of localized variations of wrestling, is the way in which concepts which are deeply rooted in the *bukh* tradition are also applied to frame how male and female athletes perceive their own involvement in Olympic wrestling. Though a number of concepts and motifs are worthy of further investigation, this study will focus mainly on the notion of bloodlines or hereditary success (*bökhiin udam*). In addition to widespread use and recognition among both *bukh* and Olympic style athletes, Adiyahuu, the afore-mentioned scholar from Avarga, stated that it was one of the principle variables he looks for when selecting athletes. Therefore, not only is this concept used by athletes to frame their participation in the sport, but it is also a variable that can influence an athlete's career trajectory. Of course, usage and application vary among individuals, yet, it is significant that it is nonetheless mutually recognized and understood by members of the wrestling community in Mongolia. Moreover, by referencing locally embedded concepts, as well as applying them in practice, Olympic wrestling athletes and coaches hail a cultural legacy that is firmly set in the Mongolian context, and to some degree integrate Olympic wrestling, namely their involvement in it, into this local context. Certainly, this notion of bloodlines is not unique to Mongolia; it also resonates with other groups and in different activities across the world, such as sumo in Japan and horse racing globally. Therefore, before addressing these concepts in relation to Olympic wrestling in Mongolia, they need to first be unpacked in their own social and historical setting.

The idea of bloodlines in relation to sport has to do with physical characteristics, and perhaps cognitive characteristics too, being passed down from generation to generation (Mikkola, 2019). However, to understand this in the Mongolian context, we should look to the broader frame of kinship and its role in Mongolian society. Jagchid (2019) suggests that as far back as the 12th century, the kinship unit, *obogh,* was the basic social unit in society. The significance of kinship groups is highlighted in *The Secret History of the Mongols* (the earliest piece of Mongolian literature written approximately twenty-five years after Chinggis Khan's death in 1227; see de Rachewiltz, 2004 for the translation), which records various kin-group alliances and struggles for power. Scholars generally agree that before Mongolia was united by anything resembling the concept of a nation, it was characterized by tribal groups which were largely based on clan lineages who did not necessarily see themselves as comprising a cohesive Mongolian group (Kaplonski, 1998; Jagchid, 2019).

Following the formation of the Mongol Empire by Chinggis Khan, the concept of lineage was reframed according to the new political situation. In both a literal and symbolic sense, lineage was highly relevant for the ruling group, the *taiji,* who were Chinggis' relatives and descendants. This group owed its position and the legitimacy that underpinned this position to blood ties with the Khan of Khans. However, according to Atwood (2012), for commoners who were subject to the *taiji,* the principle variable organizing this level of society and defining identity was access to shared resources rather than hereditary ties. This distinction is blurred largely due to the extent to which territorial and social administrative units were modelled as kinship units, of sorts, in which the relationship between *taiji* and commoners was framed as a patrimonial hierarchy, "partly as a parent to children and partly as a master to slaves" (Atwood, 2012, p.3). Jagchid (2019), too, notes that 'pre-nation 'Mongolia also featured larger groups that included several kinship groups and were based around shared lifestyles and livelihoods, and one must therefore also include shared resources.

Much more recently, lineage has also been used to foster group membership at the national level. Throughout the 20th century, the notion of Pan-mongolism, which expressed ideas like Mongolian purity and Mongolian blood, found some traction in response to surging nationalism around the globe (Bulag, 1998). This idea was, like the earlier system Atwood describes, based on the symbolic status of a "paramount leader who established the largest land empire the world had ever seen" (Bulag, 1998, p.136). Although pan-Mongolian sentiments or aspirations were, and continue to be checked by its neighbours (China and Russia), Chinggis Khan and the notion of a Mongolian lineage continues to be a powerful political motif.

Admittedly, the formulation, application, and significance of hereditary success in Mongolia's history and political culture can only be addressed superficially here. Yet what these very brief examples show is that it is indeed firmly set in an ideational framework which is rooted in Mongolia's history and society. Moreover, regardless of whether hereditary success or lineage is used by individuals in an overtly genetic sense or leans towards more of a social, cultural, or political reading, it is nonetheless a potent and broad concept that straddles each of these categories. In this way, it evokes a meaning that is specifically tied to the Mongolian's sense of themselves and their history. Of course, at the individual level and in the context of wrestling it is not necessarily the case that people are intentionally referencing these historical events and structures. However, this history certainly underpins this concept's contemporary relevance and impact, whether in wrestling or in politics.

Engaging locality in Olympic wrestling

Given *bukh's* close connection to Mongolian history and culture, as well as its status as one of the country's three national sports (in addition to horse racing and archery) it is understandable that concepts like bloodlines play a role in influencing how wrestlers frame their involvement in the sport. Though perhaps not surprising considering Olympic wrestling's intimate relationship with *bukh*, it is still significant that these specific concepts and terms are also highly relevant to how Olympic style athletes and coaches frame their perception of the sport and their experiences. Moreover, it is not only that these concepts familiar in the Olympic context, they are advocated, legitimized, and woven into personal biographies in relation to Olympic wrestling styles. This process is similar to what Appadurai (1996) describes in his work on *locality* reproduction, in which intercontextual interactions produce new contexts which carry forward concepts and structures relevant to the social unit in question, but in a way that bears the influence of external processes and forces. It should be mentioned that this process of reproduction and transformation need not entail conflict or contradiction.

When asked how wrestlers and athletes understood bloodlines, athletes at every age group immediately referenced a family member that had earned a title at a district, regional, or national *bukh* tournament. Those without a *bukh* bloodline also admitted that they were the first of their family to participate and they did so boldly, as if charting new territory. In the case of the former, bloodlines were often presented as grounds for their involvement in wrestling (regardless of whether it was *bukh* or Olympic style, or male or female). For the latter, the lack of a bloodline lent weight to their agency; to *their* decision to take-up this sport. Most also explained that rather than being imbued with their ancestors' strength, bloodlines meant having a family member who wrestled, yet also that social dynamics must play a role. In fact, this concept was almost exclusively explained

in terms of the influence and support from family members who generate shared interest and ingrain cultural norms.

What was also evident is that among Olympic wrestling athletes, the concept of bloodlines was translated or applied unproblematically to Olympic wrestling. For example, although women do not compete in *bukh,* female athletes claimed these concepts in their biography. In this sense, not only do Olympic wrestling athletes use *bukh* concepts to frame their engagement with the sport, which also references their own cultural system, in doing so they are carrying these concepts into new spheres of activity and therefore extend in real experiences the concepts usage and meaning. Olympic wrestling is indeed an international sport, however, we would do well to further examine its local expressions which tie it to wrestling's global relevance and diversity.

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EVALUATION OF A NEW METHOD FOR THE ASSESSMENT OF REACTION TIMES OF FREESTYLE WRESTLING ATHLETES USING BARBAS "3D WRESTLING DUMMY"

Athanasios Gkrekidis[1], Nikolaos Aggelousis[1], Ioannis Barbas[1], Erasmia Giannakou[1]

[1]Democritus University of Thrace

athagkre1@phyed.duth.gr

ABSTRACT
Olympic wrestling is a sport that requires a high level of development of all physical abilities (strength, speed, endurance, strength, flexibility, etc.), and good technical and tactical levels. Over the years and with the ever-increasing performances of its athletes, Olympic wrestling has evolved into an even more demanding sport, with many elements influencing high performance, and winning or losing depending on the details. The fast reaction time of athletes is one of the most important factors for performance in the sport of wrestling. The purpose of the research was to study the reliability of a new method of evaluating the reaction time of male and female wrestling athletes, in simulated movements of freestyle wrestling. The study involved 18 athletes, boys and girls, who volunteered. Of the 18 individuals in the sample, 6 were girls with a mean age of 15 ± 1.92 years and 12 boys with a mean age of 21.25 ± 2.39 years. The new method for evaluating the reaction time of freestyle wrestling athletes that was used combined the use of the Barbas 3D Wrestling Dummy, an extensiometer, and two force platforms on which the athletes were standing. The results showed that the reliability of the new method proved to be moderate to high. In conclusion, the reliability of the new method is considered acceptable, but further research is needed to determine the effects of user training on the reliability of this method.

Key Words: freestyle wrestling, reaction time

INTRODUCTION

Wrestling is considered one of the oldest sports. By its nature it is a challenging, complex sport that dictates the simultaneous and harmonious cooperation of body and mind. A wrestling athlete should have, developed at a high level all of his physical abilities (strength, speed, endurance, power, flexibility, etc.), and a good level of technique and tactics. Over the years and with the ever-increasing performance of its athletes, Olympic wrestling evolved into a sport of even higher demands, with elements that influence good performance to be many, and now victory or defeat depends on details. Reaction time is one of the most decisive elements for good performance in the sport of wrestling (Kaya, 2016). The reaction time is defined as the time elapses from the onset of a stimulus to the onset of the kinetic response by the athlete.

In a wrestling match the athlete is required to react as quickly as possible to any movement of his opponent as the time limits for a successful attack, defense or counterattack in wrestling are very small. Gierczuk et al. (2017) mention that a wrestler must react quickly to the movements of an opponent's limbs or torso, to the referee's indications, to the coach's remarks, to the public or to the data of a points table. Kaya (2016) characteristically states that wrestling athletes in a match must react quickly when they see the movement of an attack to the leg, by taking their leg away or going on a counterattack.

In this sense, reaction time is a decisive factor in performance and is closely correlated with the ability of the wrestlers to take immediate decisions, especially under the pressure of their opponents (Kaya, 2016; Yoon, 2002). The great importance of reaction time is highlighted by Iri, Aktug, Koc, Sahin and Murathan (2016), which state that reaction time is one of the most important factors influencing success in wrestling and sports generally. A wrestling athlete should have as short as possible reaction times as the success of a defense or an attack in a match is directly linked to the athlete's quick reaction and is determined to a large extent by it.

These works underscore the great importance of reaction time for good performance in the sport of wrestling. In their research the Celenk et al. (2015) mention that it is seen in a review of literature that the reaction time of athletes can be improved through training. As in any feature that improves through training, reaction time is also critical to evaluate so that it becomes known to the coaches, if the desired changes are made through training. It is therefore easy to conclude the great importance of the correct assessment of the reaction time of wrestling athletes.

So far, any research carried out on the evaluation of the wrestlers' reaction time used methods that included a reaction to an audio-visual stimulus that was a light or a signal on a screen or a sound and the response to these stimuli was the push of a button with the foot or the hand, as in the surveys of Celnek and et. al (2015), Kaya (2016), Gierczuk et. al (2017) and Iri et. al (2016).

Wrestling athletes in no circumstance during a fight are called to respond to a visual light stimulus. However, they are called to respond to visual stimuli derived from the movement of the opponent's limbs such as the forward or backward movement of a leg and many others. But whatever the stimulus is in a match, a wrestling athlete will never respond to it by pressing a button with fingers or toes or in a similar way seated in front of a screen.

Due to the great importance for performance, as demonstrated above, of the reaction time of athletes, it is considered useful to find a way of evaluating the reaction time that can better simulate the situations that take place in a wrestling match and can be more realistic so that both the stimuli and the reactions of the athletes to the stimuli are similar to those that would take place in a wrestling match. The aim of the research is to study the reliability of a new method that evaluates the reaction time of wrestling athletes, in simulated movements of the sport of freestyle wrestling. The new method combines the use of the Barbas 3D Wrestling Dummy (Figure 1) and force platforms on which the athletes were standing. The dummy simulates the size of an average person and stands in the same way as a wrestling athlete in a match.

METHODS

Sample

The research sample consisted of 18 wrestling athletes, boys and girls, who participated voluntarily in the research. Of the 18 subjects of the sample, 6 were girls with an average age of 15 ± 1.92 years and 12 boys with an average age of 21.25 ± 2.39 years. The athletes selected were from various parts of Greece, the girls were all members of the national team of Greece, as well as three of the boys in the categories of their age and weight, while the other participants were national level athletes. The selection of the athletes was based on their training and match – participation level and their ability to attend at the place where the research took place at the dates of the survey. All measurements were made at the biomechanics Laboratory of the School of Physical Education and Sport Science of the Democritus University of Thrace, which is based in Komotini. All participants were familiar with the use of the techniques used as responses to stimuli and their application on the dummy. The height of the athletes was measured by a measuring gauge and their weight using a force platform.

Description of the instruments used

The "Barbas 3D Wrestling Dummy" was used in the measurement process to produce stimuli and to perform techniques on it as a response from the participants (Figure 1). The dummy simulates the size of an average person and stands in the same way as a person that wrestles. The height of the dummy is 1.75 meters, so it can be easily used by short or tall athletes. This wrestling dummy simulates the human body and consists of 12 joints located in the upper part (shoulder, elbow and wrist) and lower limbs (hip, knee and ankle). The shoulders, elbows, hips and joints of the knees are loaded with a spring to provide resistance. The joints allow movements of the body parts to the sagittal plane (flexion/extension) and frontal level (conduction/abduction). Each joint is pre-curved so that the position of the dummy mimics the basic stance of an opponent in wrestling. The spine is represented by a large compression spring that gives the trunk freedom of movement on a three-dimensional level and returns to the neutral position after force application. Between the neck and the head there is no joint, and both parts of the body are joined together and there is no movement between them (Barbas et. al 2017).

Figure 1. "Barbas 3D Wrestling Dummy"

At the point of the ankle at the dummy's feet ropes were tied with the other end of which was tied to an improvised wooden construction that simulates the form of the wooden cross of a puppet. The cords of each of the two legs were attached to the left and right edges respectively of the horizontal wood of the structure (Figure 2). The ropes and the wooden construction served in the production of visual stimulus related to the sport of wrestling as it will be analyzed below.

Figure 2. Wooden construction and connection with the dummy's legs

An extensiometer (CD-60, Interfels) which was attached, with a thin rope extension, to the legs of the dummy at the point of the ankles, was used to mark the exact time of the appearance of the stimuli of the measurement process (Figure 3). Finally, two in-floor force platforms (Kistler) were used with the NEXUS (Vicon) software. The athletes were standing on the force platforms in order to record the first appearance of force at the beginning of the kinetic response after the stimulus. All data was sent to a computer on which the analysis was carried out.

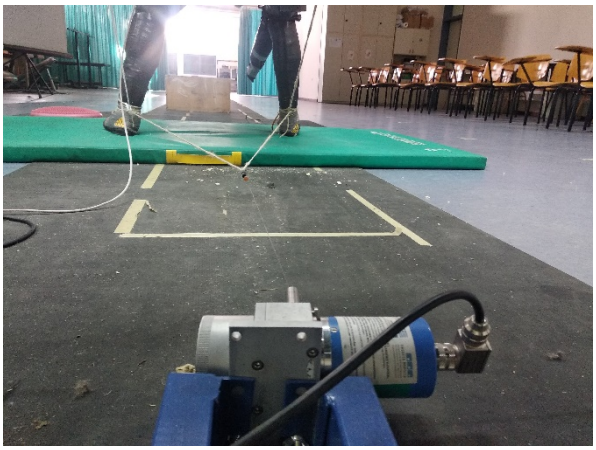

Figure 3. Extensiometer

Trials Description

During the measurements the participants were called to respond as quickly as possible to a stimulus. Both the visual stimuli and the responses were in kinesiological relevance with wrestling. There were two stimuli given to the participants. One stimulus was the backward pulling of the left leg of the dummy that was carried out by pulling the corresponding cord with the use of wood construction, while the other stimulus was the backward pulling of the right leg of the dummy and was carried out by pulling the cord connected to the right leg. The participants had no visual contact with the operator of the wooden construction so that they could not figure out which of the ropes he was preparing to pull.

Each stimulus had only one response. When the stimulus was pulling the right leg of the dummy backwards, the examinees performed a low leg-snatch with a side slip (Figure 4). When the stimulus was pulling the left foot of the dummy backwards, the examinees performed a one leg takedown (Figure 5). The position of the examinees on the force platforms remained the same throughout the measurements

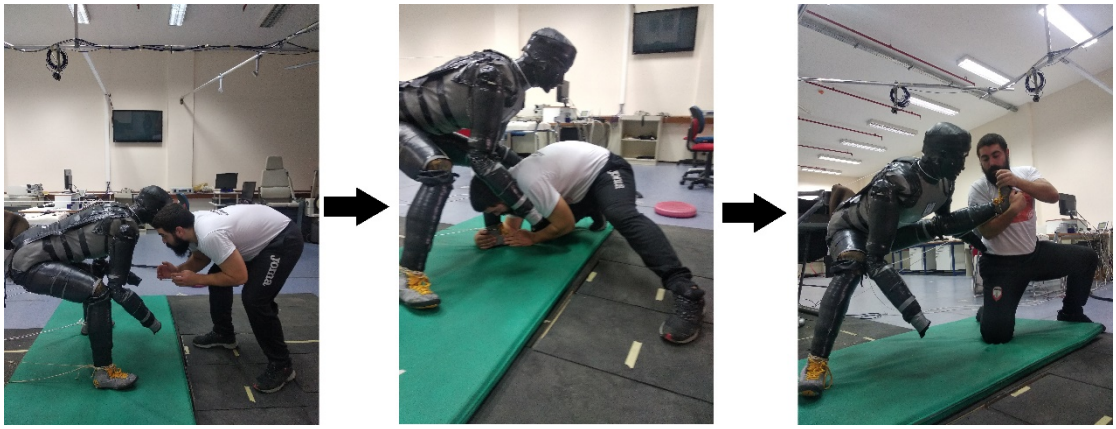

Figure 4. Low leg-snatch with a side slip

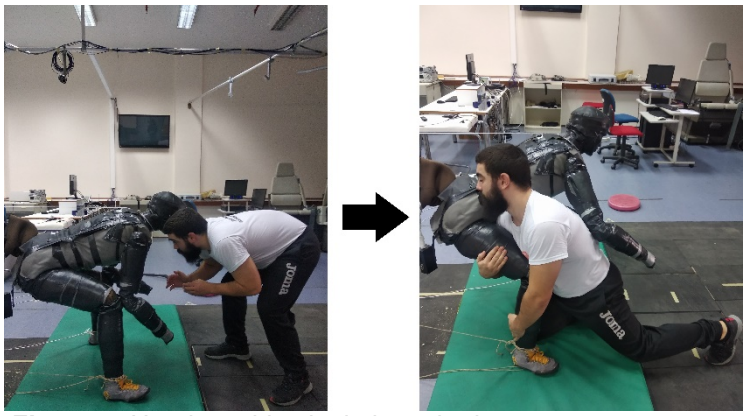

Figure 5. Head outside single leg takedown

Measurements procedure

The measurement process began by measuring the height and weighing of the participants. After that the examinees found the position of their feet on the two force platforms according to their wresting stance and the position of their feet was marked in order to maintain the same position throughout the hole duration of the measurements. Then the exact spot of the dummy's legs was marked, so that their positions would remain the same after the pulls throughout the measurements. Afterwards the athletes performed a test trial for each stimulus with the corresponding response. An attempt with the stimulus being pulling right leg backwards and an attempt with the stimulus being pulling the left leg backwards. In every stimulus the responses were the ones mentioned above. The actual measurements would start after the test tries were completed.

Each subject performed five consecutive attempts with each stimulus from which the first and the last one was excluded from the data analysis. There was a 10-seconds break between each attempt and a half-minute break between each set (five attempts).

Research design

In order to check the reliability, the Intra - class correlation coefficient (ICC) of the reaction time values in the three measurements was calculated. The ICC was calculated using a two-factor variance analysis model (two-way ANOVA) (Baumgartner, 1989):

$$ICC = \frac{MS_s - MS_i}{MS_s}$$

where, ICC: the internal correlation coefficient of measurements (score) MSs: the mean square between measurements (score), MSi: the mean square of the interaction between the measurements (score) and the subjects.

Pearson's correlation coefficient (R) between reaction time values in the various measurements was also calculated. In order to control the change in reaction time values in different measurements, variance analysis was performed for repeated measurements (3x2), with repeated factors measuring (1, 2, 3). For all statistical analyzes the level of statistical significance was set at $p < .05$.

RESULTS

Descriptive statistics – Averages

The averages and standard deviations of the kinetic stimulus reaction times in each measurement condition are presented for the three tries in figure 6 and table 1.

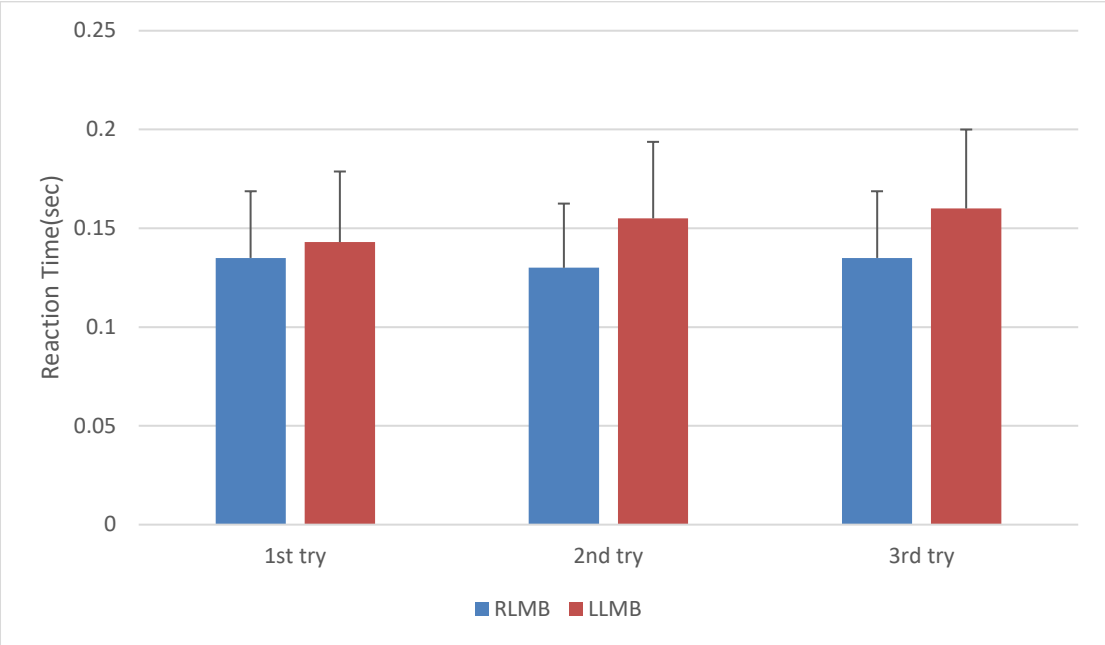

Figure 6. Averages and error lines of reaction time to kinetic stimulus in each measurement condition for the three attempts (RLMB: Right Leg moving backward, LLMB left Leg moving backward).

Table 1. Averages and standard deviations of the reaction time to a kinetic stimulus in each measurement condition are presented for the three attempts (RLMB: Right leg moving backward, LLMB left leg moving backward)

	1st Try		2nd Try		3rd Try	
RLMB	0.135	±0.023	0.130	±0.031	0.135	±0.041
LLMB	0.143	±0.042	0.155	±0.045	0.160	±0.045

Correlation analyses.

Table 2 presents the results of analyses of the relationship between the reaction time values of the kinetic stimulus in the three attempts.

Table 2. Correlation coefficients (R), intra-class correlation for a single measurement (ICC1) and intra-class correlation for the average of measurements (ICCavg) for each variable (RLMB: Right Leg Moving backward, LLMB: Left Leg move backward)

VARIABLES	**R**	**ICC_1**	**ICCavg**
RLMB	0.061 - 0.661	0.329	0.596
LLMB	0.401 - 0.755	0.571	0.800

As shown in table 3, the values of reaction time to kinetic stimulus for the three attempts exhibit moderate correlation. In addition, the reaction time for the attack on the left leg (RLMB) shows low intra-class correlation coefficients for a single measurement (ICC1) and moderate for the average of the three measurements (ICCavg). On the contrary, the reaction time for the attack on the right leg attack (LLMB) shows a moderate interclass correlation rate for a single measurement (ICC1) and a high coefficient for the average of the three measurements (ICCavg).

DISCUSSION

As mentioned above, the research on reaction time of wrestlers so far evaluated the reaction times of the athletes using methods that included as stimuli visual signals of light or shapes as well as beeps and as answers key/switches pressures with the athlete's limbs. Movements and stimuli that were not in relevance to the sport of Olympic wrestling. It was therefore considered necessary to seek a new way of evaluating reaction time and to study its reliability in order to establish whether the reaction time of wrestlers can be reliably measured in a new and more "practical" way.

In this context, the reliability of using a method that is in kinesiological relevance to the sport of wrestling was investigated. A method which includes kinetic stimuli that could be encountered by an athlete in a wrestling match, and at the same time this method could be standardized to ensure high reliability of reaction time measurements.

The aim of the research was therefore to study the reliability of a new method of evaluating the reaction time of wrestling athletes, in simulated movements of the freestyle wrestling sport, using the Barbas 3D Wrestling Dummy. The initial research hypothesis considered to be that the measurements of the reaction time of the wrestlers with the new method would be characterized by high reliability factors, expressed by the inter-class correlation coefficient between the repeated measurements, regardless of the type of stimulus.

From the results it was found that the reliability of the new method, for a single measurement, proved to be low to moderate. In particular, the reaction time for the attack on the left leg (RLMB) showed low intra-class correlation coefficients (ICC1 < 0.4) (RLMB: ICC1 = 0.329). Conversely, when the attack occurred on the right leg, the correlation coefficient for a single measurement (LLMB) proved to be moderate (0.4 < ICC1 < 0.7).
In regard to the reliability of the new method of evaluating the reaction time of wrestling athletes, when the average reaction time in more than one measure is taken as a performance, it has proved to be moderate to high. In more detail the reaction time values for the attack on the left leg (RLMB) show moderate interclass correlation coefficients for the average of the measurements (0.4 < ICCavg < 0.7) (RLMB: ICCavg = 0596). On the contrary, when the attack occurred on the right leg (LLMB), the reaction time values of wrestling athletes had a high correlation coefficient for the average of the measurements (ICCavg "0.7") (LLMB: ICCavg = 0800). In summary, the results of the present investigation found that the new method is characterized by an acceptable reliability regardless of the stimulus and the desired kinetic response for more than one measures and can be the basic method of evaluating reaction time of freestyle wrestling athletes.

The reliability of the new evaluation method is likely to have been influenced by the participant factor as the measuring instruments used were all proven to be valid and reliable. The wide range of the participants ' age is one of the factors that could have influenced the process of measurement as age is one of the factors influencing reaction time (Kolinski 2012). Also, the difference in experience, especially in the years of engaging with the sport, of each participant in relation to the others, probably influenced the reliability of the measurements. Another possible cause is that in their daily training as well as in their matching career, the participants do not all use in the same degree the techniques that were chosen in the research as response to the stimuli. The techniques used in the research were chosen so that all the participants knew their correct technical execution. Another reason for the techniques chosen was for them to be able to be performed on the "BARBAS 3D WRESTLING DUMMY" but also the participants to have prior familiarity with them, without that meaning these techniques were the main techniques used by the participants in their daily and favorite "repertoire" of techniques.

Another reason that could have influenced the reliability of research is that the reaction times of male and female athletes were evaluated and analyzed together although as reported by Kolinski (2012) the reaction time is influenced by gender. In addition, the reliability may have been influenced by the fact that the kinetic stimuli used for the attacks on the right or left leg were the movement of the opposite leg backwards, while it is more common in real conditions that the stimulus is the opposite, the movement of the right leg forward causes as a respond to the attack the right leg and respectively applies for the left.

CONCLUSIONS-SUGGESTIONS

As is evident from the above, the reliability of this method is considered to be entirely acceptable. In addition, the reliability was probably influenced by the characteristics of the participants. Therefore, researchers ' opinion is that possible changes in the level of the sample's performance and in the degree of their training to maximize the reaction time may increase the reliability of the research.

It is proposed to carry out further research on the reaction time in wrestling particularly with methods that are kinetic relevance with wrestling situations as was done in this investigation. In this direction it would be useful to measure teams of male and female athletes of higher and lower athletic levels in order to show and compare any differences in the results in terms of the reliability of the new method depending on the athletic level of the

participants. It would also be interesting if the athletes started the measurement while having contact with the dummy and not without touching the dummy as it happened in the current study as it may result changes in their reaction times.

Another proposal is to carry out a research with the same means, the same procedure and the same stimuli but with different kinetic responses, since from the 18 techniques that can be performed in this particular dummy only two were used in this research.

Finally, another proposal is to evaluate the reaction time of wrestling athletes with the same method that was used in this research before and after reaction time and to compare the results with previous similar studies, in which the athletes were not invited to respond to the stimuli by performing a wrestling technique.

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UKRAINIAN WRESTLING: ACHIEVEMENTS, CONTRADICTIONS, PROBLEMS, PERSPECTIVES

[1]Korobeynikov G., [1]Matveyev S., [1]Danko G., [1]Vorontsov A. [2]Curby D., [1]Korobeynikova L.G., [3]Tropin U.

[1]National University of Physical Education and Sport of Ukraine, Ukraine
[2]International Network of Wrestling Researchers, USA
[3]Kharkiv State Academy of Physical Culture, Ukraine

k.george.65.w@gmail.com

ABSTRACT
The Ukrainian school of wrestling – is one of the strongest in the world. Ukrainian Greco-Roman, Freestyle, Female, Judo and Sambo wrestlers have won World and Olympic titles in different times and almost in all weight categories. These results were achieved, due to the structured competitive activity combined with a proper preparation system. Nowadays, level and performance of sports results have been slightly decreased. This can be explained by existence of several contradictions and problems, which inhibit implementation of main features of competitive activity at major tournaments, which underlines the relevance of selected topic for the current research.
Key words: wrestlers, types of competitive activities, technical and tactical characteristics.

INTRODUCTION
Competitive activity was and will be one of the mains topics of research in different sports, especially in cyclic types of sports (Platonov, 2013). From the 80-90s' of last century and until today, it has caused the interest of experts and researchers in martial arts, including Olympic styles of wrestling (Platonov, 2013; Korobeynikov, Latyshev, Latyshev, Goraschenko, & Korobeynikova, 2016; Tünnemann, 2016; Latishev et al., 2018; Radchenko, Korobeinikov, Korobeynikova, Shatskikh, & Vorontsov, 2018).

Based on the observation results on formation of competitive activity of Ukrainian athletes in different types of wrestling styles within several decades, and based on the experts' assessments, it can be concluded that that major achievements of Ukrainian athletes in the 50-60s' and modern performance arose as a result of certain contradictions. These contradictions are related with competition of various sports schools in Ukraine. Especially, world achievements of Ukrainian wrestlers – Bogdan I., Gurevich B., Shahov M., Sayadov G., Salimulin, Kolchinskiy O., Novikov S., Niberidze and many others, were the result of creative work of famous coaches: Yaltiryan A., Rybalko V., Voloshuk Y., Komov, M., Burakov G., Vilenskiy, Maslennikov and others. Due to the high coaches' professionalism, a strong foundation of Ukrainian wrestling was created, which prepared the achievements on the world level.

Due to personal experience, coaches were forming methods and structures for wrestlers' preparedness with consideration of individual characteristics and competitive activities requirements. There are more than enough cases, which can confirm this methodological approach in the process of sports training. Synyavskiy V. and Shahov M. demonstrated effective competitive activity both in standing position and in parterre. Particularly high-quality skills were demonstrated in parterre while blocking defending opponents' by using special technical and tactical skills, which require specific strength actions.

One of the striking competitive features of Olympic champion Pinigin P. was special endurance, which created opportunities for an effective combinational manner of wrestling. The strong foundation for his victories was created by the famous coach Burakov Y.

Speed and strength qualities ensured excellent conditions for implementation of technical and tactical actions for S. Novikov at the highest competition level, including the Olympic Games in Montreal. By the way, Japanese judo World champion, was defeated by him by using a throw over the chest, which was assessed as a typical technical action in Greco-Roman wrestling.

It is appropriate to mention the multifold champions of the USSR A. Dzhangobekov and M. Kozitskiy, who were unreachable at competitions. They differed significantly from each other as wrestlers during competitive activities. Dzhangobekov used special strengths qualities, flexibility and endurance, while Kozitskiy used coordination and speed. Their coaches Voloshuk Y. and Shkolnikov D. effectively considered characteristics of wrestlers in accordance with the implementation of individual training loads.

It should be noted, if Dzhangobekov A. would attempt to increase his level of reaction and speed qualities in general, instead of special strength capabilities, while Kozatskiy M. would pay attention on strength enhancement, instead of special explosiveness, this would lead to a decrease in their competition activity effectiveness. This can be applied to many others famous athletes. Due to the tremendous experience and professionalism, their prominent coaches, almost without mistakes, took into consideration improvement of individual qualities and characteristics of competitive activity for each athlete. This strategy ensured victories at Olympic Games, European and World Championships.

Purpose – improvement of sports preparation of wrestlers by considering individual characteristics of competitive activities.

Objectives:

1. To analyze the current issue by using information from relevant sources and sports practice.
2. To generalize and systematize the main contradictions and problems that impede successful competitive activities.
3. To propose methods for increasing the effectiveness of competitive activities of Ukrainian wrestlers.

Methods: analysis and synthesis of actual material.

Results

The results of the analysis of literary sources and preparation practice of different styles wrestlers (Greco-Roman, Freestyle, Judo, and Sambo), allowed to us to identify peculiarities related occurring nowadays in comparison to the previous era of total success, and to draw attention to modern problems. The elimination of such issues may create the foundation for the future prospects for the Ukrainian wrestling.

Major contradictions can be attributed to:

- Establishment of Ukrainian wrestling foundation and preparation of famous wrestlers were promoted by enormous practical experience of coaches based on their effective professionalism. However, there was a lack of informational, scientific and technical provisions to ensure an effective training process implementation in 1960-1980s'.
- Decline of scientific and technical potential that provoked a loss of leadership positions in Ukrainian wrestling from the beginning of 90's of the past century and at the first quarter of XXI century.

Retrospective development analysis of Ukrainian wrestling, and current training system, allows one to identify problems affecting its further progress; to diagnose specific and most common problems, which hinder wrestlers' opportunities to demonstrate effectively their individual qualities in the current competition conditions:

- Wrestlers' preparation structure formation without consideration of their individual competition activity characteristics;
- Loss of major technical and tactical elements, which can be considered as base of Ukrainian wrestling.

Ways to solve the issues.

It is known, that athletes who are in the stage of their maximum potential can be differentiated by the adaptableness level to various pedagogical influence factors (volume and intensity of loads). Therefore, the implementation of individual training program in large volumes can lead to the enhancement of functional systems of the body and sports performance enhancement. Three reasons can be highlighted, that can describe this phenomenon:

- Exhaustion of adaptation resources, which are conditioned genetically in the most cases (innate ability to high physical activity);
- The level of adaptation to the training factors was majorly executed during previous phases of training preparation (the result of the influence of prolonged loads on the athlete's body);
- Formation of wrestlers' preparation structure without consideration of individual competitive activity structure (taking into account the individual style and technical actions that an athlete performs in competition).

The results of the analysis of different preparation systems of Ukrainian athletes among different styles of wrestling, especially during the last 3 decades, allow to prove availability of narrowly focused training loads during structural segments of training process. Special and competition preparation without consideration of individual tactical types of wrestling, prevails during micro-, mesocycles, as well as in separate training phases. The effects on the body of narrowly focused training leads to unilateral level of preparedness, which limits further enhancement of athletic skills.

Success of competition activity in wrestling directly depends on correct identification of effective individual tactical models. The difference is mainly in prevalence of either technical-tactical skills, or physical and psychological readiness (Barbas, 2011).

Training process of wrestlers at the stage of maximum realization of their individual capabilities should form adaptive changes of the body, which ensure proper level of preparation in correlation with characteristics of competitive activity realization.

Analysis of literary sources and scientific research results (Latyshev, 2009) allowed us to identify the eight most informative technical and tactical characteristics of structure of competitive activity in Greco-Roman wrestling: coefficient of technical readiness; coefficient of defense effectiveness; activity coefficient; attack intervals; quality of technical actions coefficient; quantity of technical actions; activity indicator.

It is known, that the level of sports performance depends on all factors of competitive activity. However, each component affects result differently. Some components are interconnected (i.e. technical readiness coefficient and quality of technical actions, r = .993), because they are determined by related factors such as coordination qualities, others might be independent or in the stage of definite antagonism (i.e. technical readiness and defense effectiveness, r = .459), due to complete component differentiation (coordination and strength characteristics).

Results of the analysis of modern competition activity structure in wrestling, along with experts' assessment, allow us to identify the most common types of athletes' individual characteristics realization in competition matches are shown in Table 1.

Successful competitive activity interconnected with individual characteristics, which must be considered prior to important competitions. Therefore, it is necessary to consider not only the formation of general competitive structure, but also to determine individual inclination of each athlete to specific type of wrestling.

Table 1. **Most common types of competition activity realization in wrestling.**

№	Type of competition activity	Special physical characteristics, which ensure effectiveness
I	Explosiveness	Speed skills
II	High intensity	Endurance
III	Strength	Power endurance

Wrestlers of the first group demonstrate large and moderate intensity, which enhances cardiovascular, respiratory and other functional systems capabilities. Aerobic efficiency creates a foundation for overcoming massive training loads. In addition, similar training programs do not create conditions for implementation of effect if overcoming endurance for specific forms of motor actions, because sports performance of this group of wrestlers mainly depends on the speed levels.

Successful sports performance of Ukrainian wrestlers, such as Kazitsky N., Danko T., Boyko V., were achieved due to the effective training regimen usage, which can be considered as the first type. Excessive physical loads, aimed to increase aerobic capacity for other wrestlers with similar characteristics, often led to changes, which blocked high-speed abilities and sports performance accordingly.

The mechanism of this phenomena can be explained as a negative effect of training, which enhances endurance level, but has negative impact on technical and tactical actions effectiveness of wrestlers. While enhancing wrestlers' special endurance capabilities, it is worth to consider its complex multifactorial structure. Special endurance of wrestlers caused by following factors (Ebrahimi, Rahmani-Nia, Damirchi, Mirzaei, & Pur, 2013; Baić, Sertić, & Starosta, 2007) endurance during static training and energy endurance indicators during anaerobic exercises; intensity of recovery processes after specific workloads; abilities to demonstrate strength, speed, orientation during the fatigue phases. Pinigin P., Tedeev E., Stadnyk A. can be attributed to the second group of wrestlers.

It is obviously useless, to load wrestlers of the third group with work aimed to improve their speed capabilities. Some enhancement in speed will not compensate definite decrease in strength endurance, which is authoritative component for effective implementation of competitive activity structure for the third group of wrestlers.

The following athletes can be related to the third group, based on their preparation structure: Petrenko N., Charachura M., Danko G., Andreitsev V., Chotsyanovskiy A., Zantaraya G., and others.

CONCLUSIONS

It is necessary to highlight technical and tactical skills, which were immanent for Ukrainian wrestlers during the times of their best performance. The results of the analysis of famous wrestlers' practical experience and long

pedagogical observations of them during competitive activity, allowed to identify two key factors, which are considered as a foundation of Ukrainian school of wrestling:

1) Technical and tactical actions in parterre during which pressure mechanisms on opponents' body (or some parts) are being used to eliminate possible defensive actions and put opponent in a pinning situation (in Greco-Roman and Freestyle wrestling), or to gain victory by using submissive or choking technical actions in sambo and judo;
2) Throw over the chest (suplex) can be considered as an effective technical action, which is being frequently used for offense in Greco-Roman wrestling. In freestyle, sambo and judo this technical move is being used for counterattacks.

Considering above-mentioned facts, it is necessary to find solutions and overcome current problems and some contractional issues to reinvigorate and further develop wrestling in Ukraine:

1) Intuitive Heuristic tool, which was used in creation of preparedness structure of famous wrestlers during postwar period, nowadays must be complemented by informational and tactical means;
2) It is necessary to systematically perform the basic technical and tactical actions in standing and parterre position, which were used by prominent Greco-Roman wrestlers. This creates the foundation for all four styles of wrestling.
3) To build preparedness structures in current styles of wrestling, based on individual peculiarities of the implementation of the structure of the competitive activity of specific athletes.

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DEVELOPMENT TREND OF FREESTYLE WRESTLING: INFLUENCE OF THE RULE CHANGES ON COMPETITIVE ACTIVITY

[1]Marković, M., [1,2] Kukić, F., [1]Zarić, I.,Toskić, L.,; [1]Kasum, G., [1, 4]Dopsaj, M.,

[1]Faculty of Sport and Physical Education, University of Belgrade, Belgrade, Serbia
[2]Physical Fitness Testing and Research, Police Sports Education Center, Abu Dhabi Police, UAE
[3]Faculty of Sport and Physical Education, University of Prishtina, Leposavić, Serbia
[4]Institute of Sport, Tourism and Service, South Ural State University, Chelyabinsk, Russia.

mm_milanm@yahoo.com

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ABSTRACT
This paper deals with wrestling combat performance and how new rule changes have affected competitive activity. Official reports and video material of fights from the European Championships in 2013 (EC2013), before the introduction of the new rules and from the European Championships 2014 (EC2014), First European Olympic Games 2015 (FEOG2015), and European Championships 2020 (EC2020) after the introduction of new rules were analyzed for this study. Fourteen variables were used for evaluation of the competitive activity of wrestlers. Average fight time and points per action increased after EC2013, while a lower number of passivities and total points occurred at EC2013 compared to EC2014, FEOG2015 and EC2020. The number of 1-point actions was significantly higher, while the number of 2-point actions was significantly lower at EC2013 than afterwards. The number of actions worth 3-5 points was lower only when EC2013 was compared to EC2020. The number of actions per match remained unchanged. Average action value was lower at EC2013 than afterwards, intensity of scored points was lower at EC2013 than at the EC2014, while intensity of performed actions was higher at EC2013 than afterwards. A greater sum of points was noticed after EC2013, while the number of actions per match remained the same. The number of actions remaining unchanged despite the duration of matches increasing would indicate that the changes in rules may negatively affect attractiveness.
Key words: analysis of competitive activity, wrestling attractiveness, combat sport.

INTRODUCTION

The competitive activity of wrestlers (i.e., wrestling combat) represents the performance of skills and techniques against an opponent in competitive conditions, following the rules of the specific sport. Competitive activity analysis is the basic method that provides data on success in wrestling including indicators of good technical, tactical, psychological, physical and theoretical preparation of wrestlers, as well as their pattern during combat within the boundaries of set rules (Tünnemann, 1996).

Analyzing competitive activity provides an insight into the general characteristics of wrestlers and the specific characteristics of each particular wrestler, which results in being able to identify the mechanism for attaining success. In addition, it allows trends in the development of wrestling to be monitored, in order to control the validity of the rules and their potential improvements (Koropanovski & Jovanović, 2007). New rule changes have always proven to be a great challenge for coaches, wrestlers, officials and performance analysts engaged in the research of the impact of such changes on the further development of sports, coaching and technical, tactical and physical preparation (Lopez-Gonzalez, 2013; Tünnemann, 2013b). However, it is recognized that these changes are sometimes needed in order to improve sport or to increase viewership that could possibly bring in sponsors and investment to certain sports. In that regard, major changes in the rules of wrestling combat occurred in 2013, when the status of wrestling at the Olympics was questioned and revoked.

A partial reason for this decision can be found in studies conducted during the 1990s, which indicated that some leg takedown moves, that were of great importance in wrestling during the 1960s and 1970s, had almost completely disappeared from the technical-tactical repertoire of wrestlers (Shakhmuradov, 1997). Furthermore, it was found that freestyle wrestling relies on relatively simple scoring techniques, which do not carry a high risk (Podlivajev, 1999) and that the number of attractive throws per competition has been in constant decline since the Olympic Games hosted in Barcelona, 1992. Moreover, it was noted that the number of less attractive actions had increased (Tünnemann, 1998). These facts may have contributed to a decrease in the attractiveness of

freestyle wrestling for the spectator. Considering this, the first changes in the rules were introduced after the European Wrestling Championships in 2013. It resulted in a significantly higher percentage of technical pin victories, more points per fight, as well as a significantly higher number of 2-point actions and a decrease in 1-point actions, while the number of 3- and 5-point actions achieved remained unchanged (Tünnemann, 2013a). Although these changes had an effect on the dynamics of wrestling combat, they could not be considered as increasing the attractiveness of the sport (Tünnemann, 2013a).

A new set of rules were again introduced after the 2013 World Wrestling Championships, encouraging athletes to be more active in wrestling matches, while also contributing to a greater understanding of wrestling by a wider audience. The rule changes were aimed at having an impact on physical, technical and tactical preparation in the training process by adjusting them to achieve the best results within the boundaries of the new rules. Afterwards, it was confirmed that all three styles of wrestling moved in a positive direction in terms of fighting activity, but also in the average number of points scored per fight (Tünnemann, 2016; Mykola et al., 2017). On the other hand, through a series of studies, it had been determined that in freestyle wrestling the average number of actions and repertoire of techniques used in the competition did not change significantly, that attractive techniques were insufficiently used and that low risk attack techniques prevailed (Kasum & Marković, 2014; Marković & Dopsaj, 2015; Marković et al., 2017). The number of points was significantly higher due to the higher point value of actions, but the number of successful actions per unit of time has decreased due to the longer duration of the fight. However, more frequent passivities awarded and a higher number of points achieved contributed to a greater match dynamic and attractiveness in freestyle wrestling (Kasum & Marković, 2014; Marković & Dopsaj, 2015; Marković et al., 2017). Although the change of rules preserved wrestling in the family of Olympic sports, the results of previous studies did not provide sufficient forecasts for the effects of their application as the studies were conducted shortly after the implementation of the new rules. The real picture of the effectiveness of the newly introduced rules could be evaluated when coaches and athletes fully adapt physical, technical and tactical preparation of athletes to all match characteristics.

Accordingly, the question raised is whether the new set of rules significantly affected the competitive activity of elite freestyle wrestlers at the major wrestling competitions between 2013 and 2020. The aim of this paper was to investigate the specific influence of the rule changes on the competitive activity of freestyle wrestling and the trend of development of technical and tactical performance indicators of elite freestyle wrestlers. The hypotheses of this study were that the introduction of new rules will have a significant influence on technical and tactical elements of freestyle wrestling combat, that changes will occur over time and that attractiveness parameters will change by increasing attractiveness. The results of this study could offer possible proposals for the further improvement of wrestling as a sport.

METHODS

Procedures: Data regarding match performance was collected by analyzing the official reports and video materials of the fights (https://unitedworldwrestling.org) that occurred at the European Wrestling Championships in 2013 (EC2013), before the introduction of the new rules and at the European Wrestling Championships 2014 (EC2014), First European Olympic Games 2015 (FEOG2015) and European Wrestling Championships 2020 (EC2020), after the introduction of new rules. The data were generated from an open access website whereby personal information and the country identification were not used, therefore there were no ethical issues in analyzing or interpreting these data (Morley & Thomas, 2005; Ceylan & Balci, 2017). All the data were recorded directly from the scoreboard so there was no mistake in terms of recording the scores and penalties. Official reports obtained prior and after the introduction of new rules were compared and analyzed for potential longitudinal changes in trends in attaining points, thereby investigating the increase in activeness of wrestlers and the potential increase in attractiveness of the sport of wrestling. This type of research is justified when expert analyses are conducted on a sample of the most important competitions (Koropanovski & Jovanović, 2007).

Sample: The research included 536 freestyle wrestling fights: 129 fights from the EC2013, 127 fights from the EC2014, 146 fights from the FEOG2015 and 134 fights from the EC2020. Six categories were selected from each competition: EC2013 - 55, 66, 74, 84, 96, 120 kg (missing category 60 kg); EC2014 and FEOG2015 (missing category 61 and 70 kg), FEOG 2015 (missing category 61 and 70 kg) and EC2020 - 57, 65, 74, 86, 97 and 125 (missing category 61, 70, 79 and 92 kg).

Variables: Wrestling is an exceptionally dynamic activity for both competitors, with a pronounced change in the pace and rhythm of the fight, as well as changes in offensive and defensive activities (Marković et al, 2017; Marković et al. 2020). Moreover, these tasks could be realized in a standing position or while on the ground, as a planned activity or as a reaction to an opponent's action. Therefore, the identification of indicators of competitive activity in martial arts is a methodologically very complex task and obtaining objective measures of competitive activity needs to be cautiously performed. Considering this, 14 variables were used for objective evaluation of competitive activity of wrestlers that were grouped into the following sets:

General variables

1. Mean duration of the fight, expressed in seconds - FightDuration (s),
2. Type of winning (WinType), by scoring points, technical pin or pin (was not performed by statistical analysis).

Scored points

3. Average number of scored points in technical actions(PTActions),
4. Average number of scored points in awarded penalty(APenality),
5. Average number of scored points in awarded unsuccessful challenge(FChallenge),
6. Average number of scored points in awarded passivities (APassivities),
7. Total number of scored points - TnPoints.

Performed actions

8. Average number of performed actions worth 1 point(W1point),
9. Average number of performed actions worth 2 points(W2points),
10. Average number of performed actions worth 3, 4 or 5 points (W345points),
11. Total number of performed actions - TnActions.

Fight effectiveness:

12. Average action value (Aver.ActionV) – quotient of total number of points scored only by technical actions and the total number of actions in the fight,
13. Intensity of scored points (Inte.SPoints) – quotient of duration of fights and number of scored points in the fight (seconds/points),
14. Intensity of performed actions (Inte.PActions) – quotient of duration of fights and number of performed actions in the fight (seconds/action).

Statistical Analyses

All statistical analyses were performed using the statistical package for social sciences (IBM, SPSS 20.0). Descriptive statistics included mean (Mean) and standard deviation (Std. Deviation). Differences between competition prior and after the introduction of new rules were analyzed using multiple analysis of variance (MANOVA), followed by the Bonferroni post hoc adjustment for the partial pairwise comparison. Principal component analysis was used to define the key parameters of wrestling attractiveness. The level of statistical significance was set at $p < 0.05$ (Hair et al., 1998).

RESULTS

Table 1 shows the descriptive statistics of all monitored variables. In general, as fight duration significantly increased so did the PTActions and APassivities, leading to a significant increase in TnPoints. Although the TnActions remained unchanged, the W1point and W3,4,5points significantly decreased, while the number of actions for 2 points significantly increased. Furthermore, a significant increase occurred in Aver.ActionV and Inte.PActions, while Inte.SPoints decreased.

Table 1. Descriptive statistics and between-group differences (ANOVA)

Variables		Mean ± Std. Deviation				F
↓	Years:	**2013**	**2014**	**2015**	**2020**	
$Fight^{Duration}$		254.25±73.27	292.52±93.97	301.60±92.05	320.66±78.49	14.152†
Scored Points	PT^{Action}	6.69±3.46	9.46±4.33	8.72±4.30	8.12±3.81	11.165†
	$A^{Penality}$	0.01±0.09	0.03±0.22	0.00±0.00	0.03±0.21	1.419
	$F^{Challenge}$	0.16±0.37	0.10±0.30	0.08±0.28	0.16±0.37	1.993
	$A^{Passivities}$	0.15±0.40	0.50±0.83	0.49±0.70	0.66±0.73	12.949†
	Tn^{Points}	7.01±3.35	10.09±4.02	9.29±4.07	8.96±3.50	15.694†
Performed actions	W^{1point}	3.51±1.56	1.03±1.27	1.03±1.15	0.80±1.05	134.447†
	$W^{2points}$	0.91±1.10	3.50±2.06	3.20±1.89	3.30±1.80	62.636†
	$W^{345points}$	0.43±0.75	0.37±0.58	0.32±0.56	0.18±0.44	4.458†
	$Tn^{Actions}$	4.85±1.95	4.89±2.34	4.55±2.30	4.28±1.96	2.361
Fight effectiveness	$Aver.^{ActionV}$	1.35±0.36	1.98±0.50	1.95±0.43	1.91±0.45	62.727†
	$Inte.^{SPoints}$	46.30±27.41	35.89±24.30	39.95±24.31	43.15±24.00	4.081†
	$Inte.^{PActions}$	64.58±51.59	87.32±85.23	91.70±78.66	100.31±73.89	5.640†

† Significant at level $p < 0.01$.

After determining the influence of the rule changes on the investigated parameters, the numbers for penalties and challenges were excluded from further analysis due to the absence of statistically significant differences between the observed groups (p = 0.236 and p = 0.114). Although no significant difference between groups was found for the average number of actions per fight (p = 0.071), this variable was not excluded, due to its importance and for more detailed further analysis. The differences in all other variables between the specific competitions are shown in Table 2. Pairwise comparison revealed significant gradual increase in FightDuration and PTActions were lower in 2013 compared to competitions from 2014, 2015 and 2020. Moreover, significantly higher values in FightDuration but lower PTActions occurred in 2020 compared to 2014. Furthermore, significantly lower numbers of APassivities and TnPoints, occurred at EC2013 compared to EC2014, FEOG2015 and EC2020. Considering performed actions, the number of W1point was significantly higher, while the number of W2points was significantly lower at EC2013 than at EC2014, FEOG2015 and EC2020. The number of W345points was lower only when EC2013 was compared to EC2020, while TnActions remained unchanged. Regarding fight effectiveness, Aver.ActionV was lower at EC2013 than at all competitions analysed afterwards, Inte.SPoints was lower at EC2013 than at the EC2014, while Inte.PActions was higher at EC2013 than at the FEOG2015 and EC2020. However, there was no significant difference in performed actions and fight effectiveness between the competitions that were held after the new rules were introduced.

Table 2. Between-group differences (t test).

Variables		Years:	**2013 2014**	**2015**	**2020**	**2014 2015**	**2020**	**2015 2020**
Fight^{Duration}		Mean Diff. (I-J)	-38.27†	-47.35†	-66.42†	-9.08	-28.14*	-19.06
		Std. Error	10.63	10.28	10.49	10.32	10.53	10.17
Scored points	PT^{Action}	Mean Diff. (I-J)	-2.77†	-2.03†	-1.43*	0.75	1.35*	0.60
		Std. Error	0.50	0.48	0.49	0.49	0.50	0.48
	A^{Passivities}	Mean Diff. (I-J)	-0.35†	-0.34†	-0.51†	0.01	-0.16	-0.17
		Std. Error	0.09	0.08	0.08	0.08	0.08	0.08
	Tn^{Points}	Mean Diff. (I-J)	-3.09†	-2.28†	-1.95†	0.81	1.13	0.32
		Std. Error	0.47	0.45	0.46	0.46	0.47	0.45
Performed actions	W^{1point}	Mean Diff. (I-J)	2.48†	2.48†	2.71†	0.00	0.23	0.24
		Std. Error	0.16	0.15	0.16	0.15	0.16	0.15
	W^{2points}	Mean Diff. (I-J)	-2.59†	-2.29†	-2.39†	0.30	0.20	-0.10
		Std. Error	0.22	0.21	0.22	0.21	0.22	0.21
	W^{345points}	Mean Diff. (I-J)	0.06	0.11	0.26†	0.05	0.19	0.14
		Std. Error	0.07	0.07	0.07	0.07	0.07	0.07
	Tn^{Actions}	Mean Diff. (I-J)	-0.04	0.30	0.58	0.33	0.61	0.28
		Std. Error	0.27	0.26	0.26	0.26	0.27	0.26
Fight efectiveness	Aver.^{ActionV}	Mean Diff. (I-J)	-0.64†	-0.61†	-0.56†	0.03	0.08	0.05
		Std. Error	0.05	0.05	0.05	0.05	0.05	0.05
	Inte.^{SPoints}	Mean Diff. (I-J)	10.40†	6.34	3.14	-4.06	-7.26	-3.20
		Std. Error	3.13	3.02	3.09	3.04	3.10	2.99
	Inte.^{PActions}	Mean Diff. (I-J)	-22.74	-27.12*	-35.74†	-4.38	-12.99	-8.61
		Std. Error	9.20	8.89	9.07	8.93	9.11	8.80

Significant at level $p < 0.05$, † Significant at level $p < 0.01$.

Considering the type of match wins, the results indicate an initial decrease of 19.3% in the number of matches that were won by the number of points scored and an initial increase of 13.7% and 5.5% in the number of matches won by technical pins and pins, respectively (Figure 1 EC2013.).

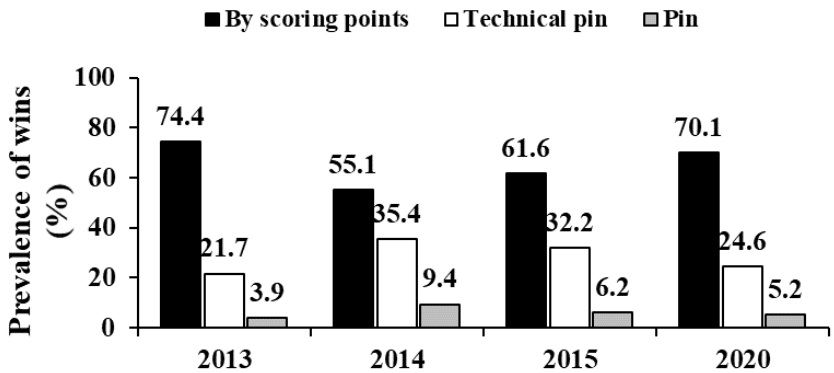

Figure 1. Type of winning in competitions.

However, it seems that this trend did not continue with time as the structure of win types was observed to be gradually reversing towards those from Principal component analysis defined two components for each of the observed groups of variables (Table 3). Variables from the scored points group explained 64.2% of the variance match performance, whereby the first component and second component comprised 42.8% and 21.4% of the variance, respectively, with PTAction being the most discriminative variable. Variables from the performed actions group explained 75.9% of the variance in match performance, whereby the first and the second component comprised 41.3% and 34.6% of the variance, with TnAction being the most discriminative variable. Variables representing the fight effectiveness explained 95.7% of the variance in match performance, whereby the first and the second components explained 61.1% and 34.6% of the variance, respectively, with Inte.PActions being the most discriminative. Figure 2 shows the changes in the key variables of wrestling attractiveness through the time course of development of the applied rules and in relation to the course of development of the duration of the fight.

Table 3. - Structure Matrix

Groups of variables		Component	
		1	2
Scored points	**PT^{Action}**	**0.987**	
	Tn^{Points}	0.964	
	$F^{Challenge}$		0.836
	$A^{Passivities}$		0.586
	$A^{Penality}$		0.227
Performed actions	**$Tn^{Actions}$**	**0.927**	
	$W^{2points}$	0.872	
	W^{1point}		0.903
	$W^{345points}$		0.457
Fight effectiveness	**$Inte.^{PActions}$**	**0.952**	
	$Inte.^{SPoints}$	0.925	
	$Aver.^{ActionV}$		0.993

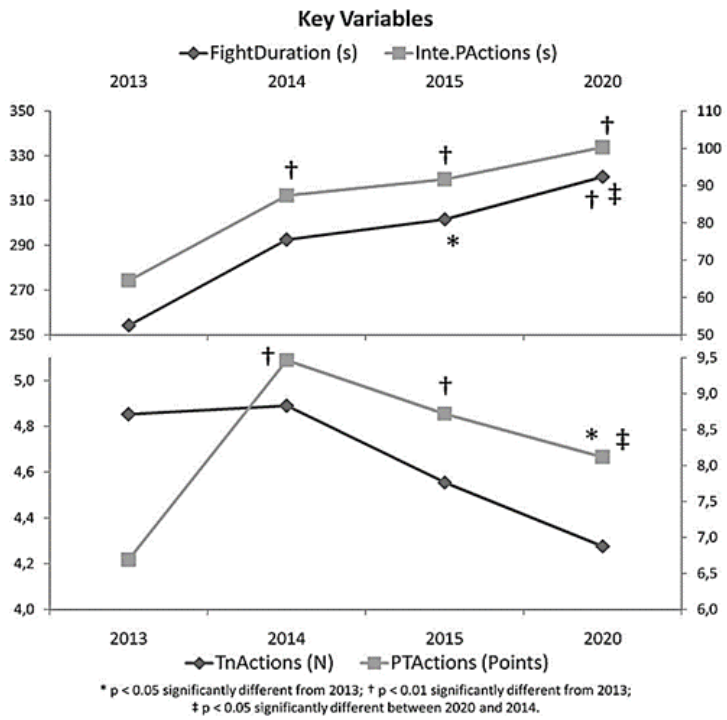

Figure 2. – Key parameters of wrestling attractiveness

DISCUSSION

The main findings of this study revealed that 10 out of 13 indicators of technical, tactical and performance indicators of wrestling combat significantly changed shortly after the set of new rules was introduced. Although the changes in these indicators remained significant at FEOG2015 and EC2020, further progress in changes occurred only in FightDuration and PTAction. Therefore, we can conclude that the first hypothesis was true, while the second hypothesis was partially true. Considering the fact that APenality, FChallenge (which depend on athlete behavior, coaches' perception and the referee) and TnActions did not change, suggests that the new rules did not result in an increase in attractiveness; therefore, the third hypothesis was not true.

The first and most basic characteristic of a wrestling fight is the duration of the match, which plays a significant role in choosing the tactical and technical approach to combat. In that regard, changing the number and duration of rounds from 3 x 120 s to 2 x 180 s could affect the physical, technical and tactical preparation. Although the official duration of the fight would remain unchanged, the intensity of the fight could increase (i.e., higher number of actions), while the tactical approach and type of attack/defense could be adjusted more frequently. This is reflected in an increment in FightDuration that occurred immediately after the new rules were introduced and continued to increase afterwards (i.e., similar to Kasum & Marković, 2014; Tuennemann, 2016; Marković et al., 2017). Changing the structure of the fight could advance the physical preparedness of wrestlers (Marković & Kasum, 2015), reflecting ina greater number of victories with technical pins and pins of physically dominant wrestlers. However, it appears that as time passed and training plans were adjusted, the number of fights won by points again increased, while the number of victories by technical pins and pins reduced (Figure 1).

Another important change in the rules was related to an increase in the value of the technique of landing on the back from 1 to 2 points, increasing the value of throwing the opponent directly to the back from 3 to 4 points, and insisting on a more active fight by an increase in awarded passivity. This led to significant differences in the way the points were scored such as PTActions, APassivities and in the structure of scored points represented by W1point, W2points, and W345points. Significant increases occurred in PTActions, APassivities and W2point, while W1point and W345points decreased, which overall resulted in higher TnPoints. Therefore, a higher number of scored points mostly occurred on the account of 2-point actions. Similar results were reported in previous studies that investigated the effects of changes in the rules (Kasum & Marković, 2014; Marković et al., 2017). Considering this, an increase in TnPoints occurred on the account of the same or similar technical elements as before the rules were introduced, only this time, these elements were rated higher. Keeping in mind that the number of very attractive technical elements (i.e., worth three-five points), which are the basis for attractive wrestling (Tünnemann, 2013a), also did not change, the imposed rule changes did not affect attractiveness.

A new way of evaluating the grip resulted in a rotation of the representation of W1point and W2points, which was determined by previous studies that showed that the number of actions of landing on the back did not increase but rather slightly declined (Kasum & Marković, 2014; Marković et al., 2017). Studies have already shown that top wrestlers at key competitions perform simpler and less risky techniques such as landing on the back in a standing position, actions in parterre, or pushout from the circle of the arena (Kasum & Marković, 2014; Marković & Kasum, 2015; Marković & Dopsaj, 2015; Marković et al., 2017). In that regard, increasing the value of certain simpler actions may lead to an increase in the number of small-risk actions, which may cause a decrease in the performance of more attractive and risky throws such as W345points. This further reinforces the notion that the attractiveness was not affected.

The indicators of fight effectiveness built for this study showed an increase in Aver.ActionV and Inte.PActions, indicating higher average points obtained per action but a longer time between the consecutive actions. Consequently, Inte.SPoints (i.e., shorter time per each scored point) decreased but only initially as there was no difference between EC2013 and FEOG2015 or EC2020. Given that wrestlers needed more time between two actions and that the number of actions remained unchanged it could be argued that imposed set of rules did not qualitatively affect wrestling combat. Similar observations can be found in previous studies (Kasum & Marković, 2014; Marković & Kasum, 2015; Marković et al., 2017), even indicating a negative course of development of the competitive activity of free wrestlers. Furthermore, principal component analysis extracted PTAcions, TnActions, and Inte.PActions as the most sensitive indicators of competitive wrestling performance, meaning that any change in the rules in order to increase the attractiveness of wrestling must not negatively affect these indicators. Accordingly, this study demonstrated that the different scoring of certain technical actions and the higher number of awarded passivities may increase the total number of points independently even though the activity remains similar. Moreover, the duration of fighting time increased, while the number of performed actions remained the same indicating negative trends in measures of attractiveness and match effectiveness.

CONCLUSIONS

In relation to the aim of this research, both the current and long-term effects of a key change in wrestling rules were determined. Based on the results, we can conclude that the changes in rules have contributed to the improvement of point productivity, while the number of realized actions in the fight remained the same. By increasing the duration of fights, yet limiting the possibility of increasing the number of actions in a fight, there was a negative impact on the intensity of actions in the fights at the EC2014 and in the following years it could be argued that the changes in rules may have harmed rather than improved the attractiveness of wrestling as a sport. In that regard, it should be considered that the changes in rules must have positive effects on effectiveness measures such as PTAction, TnActions and Inte.PActions. Thus, the rules should be directed towards an increase in the number of actions, especially those that are worth more points. Moreover, judges may need to consider how much tactical influence the award of passivity has on the fight and how understandable it is for the audience, so it may be abolished. This study provided an insight into the short and long-term effects of certain rule changes in wrestling on wrestlers' activity during combat, thereby also on the attractiveness of wrestling combat. The methods of evaluation from this study showed that the variables used loaded very high in principal component analysis providing the statistical value of the approach. Using this method for the analysis of wrestling competitive activity showed that imposed changes were not sufficient for the qualitative changes in technical and tactical elements of competitive wrestling.

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TRENDS IN INDIAN AND RUSSIAN WRESTLING: A COMPARATIVE STUDY

Naveen Singh Suhag

Maharishi Dayanand University, Rohtak, Haryana 124001, India

nav.online@gmail.com

ABSTRACT
This study aimed to have a comparative study of Indian and Russian wrestlers with respect to certain pre-identified parameters so as to gain an insight in the analysis of physical, psychological and physiological traits of both set of wrestlers and to identify key features that could be learned by both Russian and Indian wrestlers from each other. All the parameters, which were researched, were divided into three broad categories namely Physical variables, Psychological variables and Physiological variables. The study was undertaken on Men's Freestyle wrestlers by taking two top level wrestlers with credible past performance and top form from each national team in the six Olympic Wrestling weight divisions of 57kg, 65kg, 74kg, 86kg, 97kg and 125kg. After the collection of values for the purpose of the analyses, the various statistical procedures were employed. The required statistical calculations were computed with the help of SPSS software. The descriptive calculation and "t" test were computed. Among the physical variables that were found significant at 0.05 level of confidence includes – speed, agility, explosive strength, endurance and flexibility. However, in Abdominal Strength no significant difference was seen. Among the psychological parameters, two variables were found significant at difference was noticed in the Concentration ability. In the physiological parameters, the aforementioned five main variables were mapped but there was no significant difference.
Keywords: Wrestlers, Indian, Russian, physical, psychological, physiological parameters

INTRODUCTION
Wrestling has a unique position among Olympic disciplines in both India and Russia; as for India it is this sport that provided first individual medal to newly independent nation to lately becoming most significant contributor in the medal tally, whereas for Russia, which is a wrestling super power, with such a large medal haul that erstwhile USSR still is the highest Olympic medal winner nation even though it last appeared in 1988 Olympics. Thus, wrestling having deep roots in both Indian and Russian culture has been one of an interesting and promising area of research.

Significance of the Study
The study aims to bring out the significance through these factors between the wrestling players of India and Russia. The comparative study between a world leading nation in Russia and India will highlight the importance of overall training needs of wrestlers in India above and beyond the traditional component of physical strength alone, and will give a chance to undertake holistic training programs including psychological training.

The data to be collected and analyzed in the comparison of top wrestlers of both countries in most essential parameters required in wrestling match will be of immense help in analyzing the coaching system of India. Additionally, this research will certainly highlight the needs regarding some basic facilities, if any, into sports infrastructure to address any deficiencies that are identified. The present study has also the significance of proposing guidelines and indices for future researchers in the field of wrestling.

Sample Design
Non-probability sampling techniques were used to determine the samples for the study. Samples to compare and study from were taken from 12 wrestlers, from each country, two wrestlers from each of the 6 Olympic weight categories, i.e. 57kg, 65kg, 74kg, 86kg, 97kg and 125kg who were in national camps and in top performance form and working closely with individual wrestling experts in national teams.

Methodology of the Study
After a review of relevant literature, and keeping in view the requirements of modern wrestling discipline, all the parameters, which were studied, were divided into three broad categories, namely Physical, Psychological and Physiological variables.

Physical variables, respective test, and units

1.	Speed	50 Meter Sprint	seconds
2.	Agility	SEMO Agility Test (Kirby, 1971)	seconds
3.	Abdominal Strength	1-Minute sit-up Test	Total no. of sit-ups in 1 min.
4.	Explosive Strength	Standing Broad Jump	centimeters
5.	Endurance	Cooper Test	meters
6.	Flexibility	Sit and Reach Test	centimeters

Psychological variables and respective tests:

1.	Competition Anxiety	the Sports Competition Anxiety Test (SCAT) (Martens, Vealey, & Burton,1990)
2.	Concentration	Grid Concentration Test (Harris & Harris, 1984)
3.	Sport Self Confidence	Sports Self Confidence Inventory (Vealy,1986)

Physiological variables and respective tests:

1.	Positive Breath Holding Capacity	Clip on Nose Test	In seconds (Buteyko, 1991)
2.	Negative Breath Holding Capacity	Clip on Nose Test	In seconds
3.	Resting Heart Beat	Pulse counting & stop watch Test	Beats per minute
4.	Systolic Blood Pressure	Automatic Digital Blood Pressure Cuff	mm Hg
5.	Diastolic Blood Pressure	Automatic Digital Blood Pressure Cuff	mm Hg

METHODS

Physical Tests

(1) SPEED: Measured through 50-meter Sprint Test

In order to avoid any injury due to lack of warm up, test subjects were told to have proper warm up session of 15 minutes during which they undertook light jogging, small strides, stretching exercises. Test subjects were also made aware about the initiation and finish of the sprint.

(2) AGILITY: Measured through SEMO Agility Test

This test was administered on a basketball court with clear markings on floor. The test area is demarcated into a square with four sport-training cones on four corners, A, B, C and D. The width of the square measures 12 feet along the straight base line and 19 feet lengthwise. Two red colored cones were place between at the front end i.e. point A and point B in a straight line and same colored cones of yellow color were placed at back end of square and designated as point C and point D, again in straight line to each other. The different color code of cones is use this used to simplify the test as athletes have to sprint forward to the same color cones and once going backward they backpedal to same color cones. The athletes have to start from starting point marked as A and have to stand just outside the square near A with his back towards back line of the square as seen in Fig 1. On command of 'GO' from coach, players have to side step towards point 'B' along the front line of square. After reaching point 'B', the players have to pass the cone placed there from outside and continue to back pedal diagonally towards point 'D'. Then player has to pass the cone placed at point 'D' from inside and to sprint towards the cone placed at point 'A', passing the cone at point 'A' from outside and again has to backpedal diagonally towards point 'C'. After crossing the cone placed at point 'C' from inside, the athlete sprints forward to Point 'B' in straight line and from outside the cone placed at 'B', player will continue to side step towards starting point 'A' which is also the finish point. It is important to mention that a player has to undertake this entire test facing forward. To make player feel comfortable with test and for avoiding mistakes due to lack of understanding players were given opportunity to run it for practice once before actual test. Scoring: The fastest time to the nearest 0.1 sec of two trials was taken as the final time.

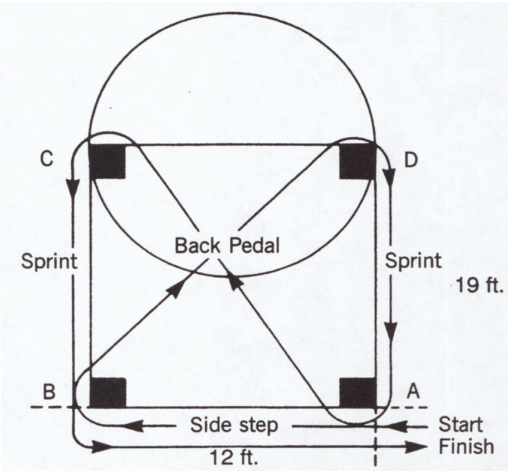

Figure 1. SEMO Agility Test

(3) ABDOMINAL STRENGTH & ENDURANCE: Measured through One-Minute Sit-Up Test

This is important in wrestling, as core strength is most essential in lifts and throws involved in most techniques. Process: The wrestlers were asked to lie down on a mat on their back with bent knees and feet on ground. It was made sure that the heel of wrestler shall not be more than 30 centimeters away from their buttocks. The subject put his hands behind their heads with fingers netted together and elbows placed on mat. To keep the subject steady, his feet were held by a partner. On the direction of 'Go' the player has to bring his head up and with elbows touching the thighs while using his abdominal muscles.

(4) EXPLOSIVE STRENGTH: Measured through Standing Broad Jump

The wrestler stands with toes up to the take off line. The wrestler jumps forward by extending his knees and swinging his arms in forward and upward direction at same time to gather momentum and landing with both feet on ground. The distance measured from inner edge of take off line to the nearest heel impression of player in the pit after landing. One practice jump was allowed to familiarize players with jump process. Three jump attempts were allowed for each wrestler, with the best distance jumped by the player in three attempts the final score.

(5) AEROBIC ENDURANCE: Measured through Cooper Test
Aim: To cover as much distance as possible by running/walking in 12 minutes time period. The players were advised to maintain a steady pace. Cooper test was administered on a 400-meter athletics track. This 400-meter track was divided in sixteen equal parts such that each is of 25 meters. All the athletes were gathered at starting line and necessary directions were given such as players should run/walk constantly for a total duration of 12 minutes. During the test there were regular announcements about the time remaining so that athletes could have an idea of the distance covered and time left. Each complete lap of each individual player was noted down. After completion of 12 minutes time period, players were directed to stop at their respective positions and their stopping place distance was measured from the starting line in case of less than a complete lap.
Score: The total distance covered by each player in the 12 minutes was calculated in meters and this was taken as the score.

(6) FLEXIBILITY: Measured through Sit and Reach Test

1. Sit on the floor with the hips, back, and head against a wall, and the legs fully extended and the bottom of the feet against the sit and reach box.
2. Place hands one on top of the other and reach forward as far as possible without letting the head and back come off the wall. Mark the distance at which your fingers reach as the zero point of the ruler.
3. Now your head and back can come off the wall. Gradually reach forward three times, the third time stretching forward as far as possible and hold the position for at least 2 seconds, making sure that during the test the backs of the knees are kept flat against the floor.
4. Measure the distance between the starting point, and the reached point.
5. The best score in centimeter of total three attempts was taken as final score.

Figure 2. Sit and Reach Test Performance

Psychological Tests
(1) COMPETITION ANXIETY: Measured trait anxiety of wrestlers through Sports Competition Anxiety Test (SCAT). To access the competition anxiety of players as there is direct relationship between anxiety levels and sports performance of a player. Higher anxiety levels are detrimental for good sports performance. The wrestlers were instructed to read each question of the test which asked them to indicate how they generally felt in competitive sports situations and respond using a three-point ordinal scale - Rarely, Sometimes and Often, choosing one among three.
Score: Total score of SCAT ranges from 10 to 30 where 10 stands for low anxiety levels and 30 being the highest.

SCAT Score	Analysis
Less than 17	Low level of Anxiety
17 to 24	Average level of Anxiety
More than 24	High level of Anxiety

(2) CONCENTRATION: Measured through Grid Concentration test
Process: The Grid Concentration Test Sheet contains counting from ‘00’ to ‘99’ in jumbled form in ten rows and ten columns in each row. Players have to use their concentration power to locate the counting in that grid and strike them out with pen in a sequence starting from 00, 01, 02, 03 and so on in a consecutive manner. Players have to strike out as many numbers as possible in one minute while try to maintain the sequence of counting as far as possible. Higher the number of consecutive numbers strike off by candidate, higher is level of his concentration.

Score: The total number of counting struck off by candidate was taken as score of the candidate. In case of a sequence broken, or any consecutive number being missed by a wrestler, one mark was reduced from the cumulative score.

(3) SPORTS SELF-CONFIDENCE: Measured through the Sports Self-Confidence Inventory. Sports self-confidence can play a vital role in sports, and especially so in combat sports like wrestling. Wrestlers were told that there are no right or wrong answers on the test, and they are to base their response on their personal judgement, and on the basis of how candidate really feels, and not how candidate likes to feel. The Sports Self Confidence Inventory contains 13 test items. Each question contains nine possible options and each candidate has to mark one of the options by placing a circle on it on basis of how they feel generally about their confidence level in that situation asked in question. Candidates were asked to respond to the questions of the test on basis of how confident they generally feel when they compete in their sports. Candidates were asked to compare their own self-confidence to the most self-confident athlete they know. In each question candidates were asked compare their confidence in a particular condition to that of the most confident athlete candidates knows. For example, in question number 3 candidates is asked, "Compare your confidence in your ability to perform under pressure to the most confident athlete you know". The options range from 1 to 9 where 9 stands for high confidence level and 1 stands for low confidence level. Score: The cumulative sum of all the option values marked by candidate becomes score of that individual candidate. On the basis of raw score, the following categories are recommended:

Raw Score	Classification
13 to 47	Low Sports Self-Confidence
48 to 82	Moderate Sports Self-Confidence
83 to 117	High Sports Self-Confidence

Physiological Tests

(1) POSITIVE BREATH HOLDING CAPACITY:

Aim: To hold breath as long as possible after taking a maximal inhalation. Process: The wrestler was asked to shut his nostrils with help of tightly placed nose clip. Following this, the wrestler was asked to inhale to their maximum capacity using only their mouth. As soon as the subject stops inhaling the and closes his lips, the stopwatch was started to record time period for which player could hold his breath. The time was stopped as soon as player opens his lip to exhale air. Score: The total duration of time in seconds for which players withholds his breath after a maximal inhalation is taken as the score.

(2) NEGATIVE BREATH HOLDING CAPACITY:

Aim: To hold breath as long as possible after exhaling breath to full capacity. Process: The player was asked to shut his nostrils with help of tightly placed nose clip. Following this, the subject was asked to exhale air to their maximum capacity using only their mouth. As soon as the player stops exhaling air and closes his lips, the stopwatch was started to record time period for which player could withhold his breath. The time was stopped as soon as player opens his mouth to inhale air. Score: The total duration of time in seconds for which the wrestler withholds his breath after a maximum exhalation is taken as the score.

(3) RESTING HEART BEAT: Measured through pulse count at the radial artery for one minute.

Directions: Test subjects were told to be completely calm and fully rested before taking this test. To ensure that players are completely rested and calm this test was administrated between 6AM to 7AM while players were resting in their bed after a full night sleep. The wrestlers were visited in their living quarters. To record the heartbeat, the pulse rate was recorded by palpation at the radial artery in a minute time period. Score: The total number of pulse beats per minute is considered as score of subjects in this test.

(4) SYSTOLIC BLOOD PRESSURE:

(5) DIASTOLIC BLOOD PRESSURE:

Measured through Automatic Digital Blood Pressure Monitor (Omron Company, Model BP710). Directions: Players were told to be completely calm and fully rested before taking this test. The individual is instructed to sit on a chair and be in a relaxed position, remove any tight-fitting clothes on left arm, to remain still and not talking during the test. Process: To ensure the optimum result this test was conducted in morning after a full night sleep so that subject is without any stress. The test subject made to sit in a chair with both feet flat on ground and left arm is to be extended out resting on a table so that arm cuff of the machine is at level of heart. The standard prescribed batteries were installed in machine and machine was set up for test. Score: Systolic and Diastolic Blood Pressure figures (mm Hg) are displayed on screen.

Statistical Procedures

After the collection of values for the purpose of the analyses, the following statistical procedures were employed, in first step, descriptive statistics was employed in which Mean; SD, were computed for both groups. The required statistical calculations were computed with the SPSS software. Then, both groups were tested to observe the differences among the selected variables using t tests.

ANALYSIS AND RESULTS

The Russian wrestlers scored significantly better than their Indian counterparts on six of the tested variables (see table 1). Of the physical variables, Russian wrestlers demonstrated superior performance in Speed, Agility, Explosive Strength and Flexibility. In Abdominal Strength, Though the Russian wrestlers displayed higher level of abdominal strength, the t-value of 0.061 did not reach significance. Only in Endurance were the Indian wrestlers superior.

Table 1 Performance Data from all Variables (mean± standard deviation)

Physical variables		Indian Wrestlers	Russian Wrestlers
	Speed 50 Meter Sprint (s)	6.7±0.63	6.0±0.66 *
	Agility SEMO Agility Test (s)	11.3±0.87	10.4±0.67 *
	Abdominal Strength 1-Minute Sit-up Test	51.3±7.99	57.1±6.36
	Explosive Strength Standing Broad Jump (cm)	180.3±5.69	217.5±18.77 *
	Endurance Cooper Test (meters)	2800.0±261.9 *	2566.7±277.43
	Flexibility Sit and Reach Test (cm)	14.3±1.71	17.3±1.44 *
Psychological variables			
	Competition Anxiety (SCAT)	22.9±2.61	16.8±3.41 *
	Grid Concentration Test	10.3±2.02	11.1±2.11
	Sports Self-Confidence Inventory	90.3±5.40	103.1±10.01 *
Physiological variables			
	Positive Breath Holding capacity (s)	60.6±13.84	61.9±12.01
	Negative Breath Holding capacity (s)	29.9±5.0	30.9±5.63
	Resting Heart Rate (bpm)	50.6±3.53	48.9±4.14
	Systolic Blood Pressure (mm Hg)	121.7±4.92	117.9±5.42
	Diastolic Blood Pressure (mm Hg)	78.8±3.77	81.7±4.44

* Significant difference $p<0.05$

Among the psychological parameters, the Russian wrestlers demonstrated less Competition Anxiety and greater Sports Self-Confidence. Both Indian and Russian wrestlers possess similar levels of mental concentration.

In the physiological parameters, results from the five main variables demonstrated no significant differences between the two groups.

CONCLUSIONS/ADVICE FOR COACHES

It clearly shows that Indian wrestlers need to work on their physical development. At the same time, Russian trainers can examine if there is a need for more aerobic endurance. This is always a delicate balance between the concurrent training for both explosive power and endurance, that is demanded in wrestling.

There is need for an emphasis on improving psychological training of Indian wrestlers which is demonstrated in the lower anxiety and greater self-confidence of Russian wrestlers. Thus, this information can contribute to readjust and refine the national level coaching strategies for both national teams.

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FUNCTIONAL UNSTABLE ANKLES AND BALANCE TRAINING

Asimenia Gioftsidou, Athanasios Grekidis, Ioannis Barbas, George Pafis, Paraskevi Malliou

Department of Physical Education and Sports Science, Democritus University of Thrace, 69100 Komotini, Greece

agioftsi@phyed.duth.gr

ABSTRACT
Functional ankle instability is a condition that common occurs after an ankle sprain. However, balance training effectively reduced the risk of a recurrent ankle sprain in sport participants. Purpose: The purpose of this study was to determine the effectiveness of two different balance training programs (in stable or unstable surface), on balance ability in subjects with functional unstable ankles. Thirty-nine subjects with ankle joint instability (wrestling athletes, judo athletes and athletes doing weight training) were randomly divided into three groups, thirteen individuals each. One subject group underwent no specific balance training (Control group). The remaining two groups followed an intervention balance program for 6 weeks, 3 times per week, 20 min, using different kinds of balance exercises. One of the two training groups performed balance exercises on the floor (stable surface) with perturbation on the upper body "FB", and the other balance exercises on BOSU® ball (unstable surface) "BB". Before the beginning and after the completion of the balance program, all subjects performed static and dynamic balance tests on the balance system (deviations and targets) and on balance boards. Results: No differences ($p>0.05$) were found in all balance tests between the Initial and Final measurements in the control group. The FB and BB improve significant their performance after the completion of the training period. The BB group exhibited a greater balance improvement than FB group. Conclusions: This study suggests that balance exercises improve balance ability in subjects with functional unstable ankles, even exercises performed on a stable surface, with the proper perturbations of the upper body.

Key words: proprioception, perturbation, unstable surfaces, wrestling

INTRODUCTION

Lateral ankle sprains are one of the most prevalent injuries in high school, collegiate, and recreational sports (Buchanan et al., 2008; Bellows & Wong, 2018). Ankle sprains occur in sports that require quick direction changes, cutting movements, and rapid acceleration and deceleration (Bahr, 2002). Wrestling is one of the most mentally and physically demanding sports. However, as expected in a physical contact sport such as wrestling or judo, the athletes are prone to occasional injury. Wrestling injuries account for the second most frequent sports injuries after football (Centers for Disease Control and Prevention, 2006). Lateral ankle sprains are one of the most prevalent injuries in high school, collegiate and recreational sports (Buchanan et al., 2008). According to the United States National Collegiate Athletic Association (NCAA), the most commonly injured body part was the knee at 21% of all reported wrestling injuries, while the ankle was the third most common injury at 9% (Newton et al., 2002). Similarly, many investigators reported that in collegiate wrestling, the ankle joint was one of the most commonly injured regions (Jarrett et al 1998; Agel 2007; Yard et al 2008; Shadgan et al., 2010).

Functional ankle instability is a condition that occurs after an ankle sprain in approximately 40% of patients (Freeman, 1965). There are varies definitions of functional ankle instability (FAI) in the literature, including the "disabling loss of reliable static and dynamic support of a joint" (Vaes et al., 1998), and a "tendency for the foot to give way" (Freeman, 1965B).

Functional instability is primarily identified by self-reported instability during activities of daily living or functional activity (Buchanan et al., 2008; Docherty et al., 2005; Munn et al., 2002). Impairment of the ability to maintain unilateral postural balance has been found to be highly correlated with functional instability of the ankle (Bernier and Pierrn, 1998 Sodermank et al., 2000), which could lead to deficits such as increased postural sway that have been identified in subjects with a history of functional ankle instability (Cornwall and Murrel, 1991; Evans et al., 2004). This may be due to factors such as proprioceptive deficit, delayed peroneal reaction time, and peroneal weakness (Karlsson and Lansinger, 1993). However, single-limb postural sway has been examined in subjects with a history of FAI and healthy controls, but the results are equivocal (Cornwall and Murrel, 1991; Dochertyet al., 2005; Evanset al., 2004; Jerosch and Bischof, 1996).

As far as intervention programs for the prevention and treatment of acute lateral ankle sprains and functional unstable ankle are concerned, their common components are balance and coordination training (Mattacola and Dwyer, 2002). Freeman et al (1965) hypothesized that balance and coordination training could diminish proprioceptive deficits associated with ligamentous injury to the ankle. In a systematic review and meta-analysis, Schiftan et al. (2015) concluded that balance training effectively reduced the risk of ankle sprain in sport participants with a history of ankle sprains.

There are many different methods commonly used to train balance. The types of these exercises can be grouped in two different categories, the “static” and the “dynamic” balance exercises. “Static exercises” require that the athlete’s foot remain in the same position with the movement in the center of gravity. In order to maintain static balance the athlete must make many small corrections at the ankle, hip, trunk, arms, or head in an attempt to maintain balance. On the other hand, dynamic balance requires the athlete to move outside his or her normal base of support (Houglum and Perrin, 2001).

The effectiveness of training on an unstable surface in non-impaired individuals (Hoffman and Payne, 1995; Mattacola et al., 1995; Caraffa et al., 1996; Gioftsidou et al., 2006; Malliou et al., 2004; Malliou et al., 2008) and in individuals with functionally unstable ankles (Gauffin et al., 1988; Bernier and Pierrn, 1998; Perronet al., 2007) has been investigated and documented by various researchers. However, often the appropriate equipment (unstable surfaces) is not available to work balance ability. Whether balancing ability could be improved by performing one leg stance exercises on stable surface and changing the center of gravity with perturbations in the upper body has not been examined in both healthy and functionally impaired individuals.

In light of these important considerations, we have sought to: 1) determine the extent to which a previous ankle sprain and a self-reported instability affects the persons balance ability, and 2) investigate whether a balance-training program, on different surfaces, performed by people with functional ankle instability could have different effects on their balance ability.

MATERIAL AND METHODS

Participants

Thirty-nine college-aged individuals volunteered to participate in this study. The participants were participating in in the sports of wrestling or judo at the recreational or varsity level at least twice each week, or participating in weight training at least twice each week. The participants were divided into three groups: 1. Balance exercises on the floor with perturbation on the upper body “FB”, (age=21.12±1.45years, height=172.9±11.1cm, mass=73.89±14.23kg) 2. Balance exercises on bosu “BB” (age=21.29±1.21 years, height=173.8±11.9 cm, mass=75.35±11.39 kg), 3. Control (age=21.22±1.70 years, height=173.6±9.1 cm, mass=76.35±10.52 kg). Participants were included in the FB and BB group if they had a history of moderate to severe ankle sprains and residuals episodes of giving way or instability while engaging in recreational or competitive sport activities. Subjects in the FB and BB group had one ankle identified as unstable and one as stable. Participants were included in the control group if they had no history of ankle sprains. On the basis of self-reported dominance, the control group had limbs identified as dominant (D) or non-dominant (ND). Exclusion criteria for both groups included a history of lower extremity surgery or fracture, moderate injury to a knee or hip, or osteoporosis. The experimental procedures were in accordance with ethical standards of the Committee on Human Experimentation at the Institution where the work was conducted and with the Helsinki declaration of 1975. The two training groups FB and BB performed balance exercises for 6 weeks, 3 times per week, 20 min per session.

Balance assessment

The balance ability of all participants was assessed at baseline and after the completion of the 6-week balance-training programs. The balance ability assessment was performed with three different balance boards (boards 1a, 1b, and 2) and the Biodex Stability System (Arnold and Schmitz, 1998; Biodex Stability System, 1998; Paterno et al., 2004; Rein et al., 2011; Rein et al., 2011B). Board 1a restricted movement in the anteroposterior direction only, board 1b restricted movement in the medio-lateral direction only, and board 2 allowed movement in both antero-posterior and mediolateral directions. In the balance board tests, the subjects maintained single-limb stance for as long as possible. Three test trials were timed on each balance board and the best trial was considered for further analysis. Assessment was performed with the Biodex Stability System. The participants maintained single-limb stance (injured leg for the FB and BB group), with the Biodex platform set to freely move by up to 20° from level in any direction. At the first test, from the variance of the platform displacement (°) in the anterio-posterior and medio-lateral directions from level during the 20s test, an instability index (Ii) was computed from the Biodex system. Three test trials were carried out and the one with the lowest Ii (best performance) was further processed (Figure 1). At the second test participants attempt to move the cursor, depicting the position of the body center of mass, to a specific target on the Biodex system screen (Figure 2). The test finish when the participant “catch” the first 5 targets. Three test trials were timed and the best trial was considered for further analysis.

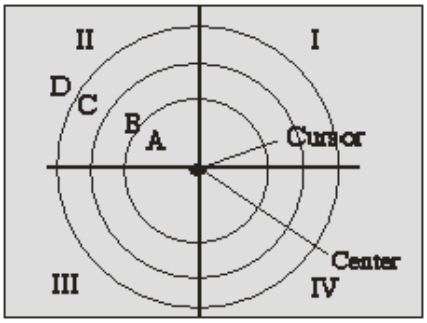

Figure 1. Biodex system screen, where participants attempt to keep the cursor at the center of the bullseye

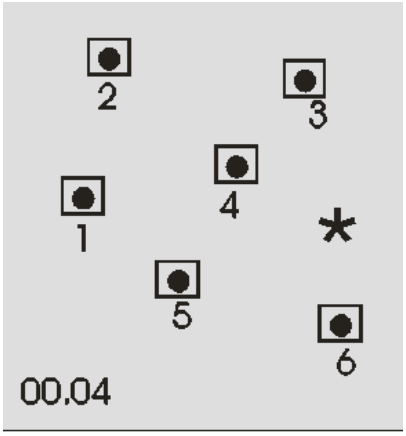

Figure 2. Biodex system screen, where participants attempt to move the cursor to a specific target

Balance training

FB group training: perform one leg balance exercises on the floor trying to changing the center of gravity, by changing the position of the other leg, by bending the torso, by disrupting the position of the upper body with a swiss ball, by pulling with an elastic band. They performed 20 sets of 45s attempt and 15s rest.

BB group training: perform one leg balance exercises on an unstable surface, on a bosu (at both sides), trying to keep their balance and performing the appropriate correction movements. They performed 20 sets of 45s attempt and 15s rest

Statistical analysis

A student's *t*-test used to test for differences between the stable and unstable ankle, and between dominant and non-dominant leg. Two-way repeated measures ANOVA was used to test for differences in balance ability in the FB, BB and Control group between the Initial and Final measure (3·2). The Scheffe´ test was used for post hoc analysis where appropriate. The level of statistical significance was set at $p<0.05$.

RESULTS

At the initial measurement in all balance tests there were no differences between dominant and non-dominant leg for the control group ($p>0.05$). However, the FB ($p<.05$) and BB ($p<01$) group revealed statistically significant differences between the stable and unstable ankle (Table 1). No difference ($p>0.05$) in balance ability was found in the control group between initial and final measure, for the dominant (D) and the non-dominant leg (ND). In contrast, the 6-week balance training program improved all the balance performance indicators examined in the FB and BB groups. More specifically, with regard to the Biodex assessment, the improvement in balance ability for the injured leg was greater ($p<0.01$) in the BB group than the FB group ($p<0.05$) at the first assessment (deviations). Similarly, for the second test (targets) an improvement in balance ability for the injured leg was greater ($p<0.01$) in the BB group than the FB group ($p<0.05$). For all the tests performed on balance boards, the improvement in balance ability for the injured leg was greater ($p<0.01$) in the BB group than the FB group ($p<0.05$) (see Table 1).

Table 1. Balance assessments

		Pre-Training			Post Training		
	Limb	**FB**	**BB**	**Control**	**FB**	**BB**	**Control**
Ii (°)	**Healthy / D**	3.21±1.8	3.22±1.2	3.55±1.4	3.23±1.5	3.29±1.5	3.51±1.6
	Injured / ND	7.42±2.7	7.56±2.7	3.32±1.2	4.76±2.9*	3.32±1.4**	3.47±1.7
Targets (s)	**Healthy / D**	2.23±1.4	2.43±1.3	2.12±1.1	2.24±1.1	2.32±1.2	2.13±1.5
	Injured / ND	6.21±2.2	6.97±2.6	2.14±1.4	3.13±2.7*	2.39±1.2**	2.21±1.3
Board 1a(s)	**Healthy / D**	9.3 ± 2.22	9.4 ± 2.43	10.6 ± 2.5	9.09±0.7	9.15±3.7	10.68 ±2.2
	Injured / ND	4.3 ± 1.2	4.13 ± 1.4	9.67 ± 2.1	7.87±3.9*	9.34±3.3**	9.71 ±2.7
Board 1b(s)	**Healthy / D**	7.38±2.06	7.63±2.87	7.45±2.34	7.24±1.5	7.64±2.1	7.52±2.65
	Injured / ND	2.38±1.6	2.75±1.9	7.67±2.19	5.43±2.4*	7.58±2.3**	7.72±2.25
Board 2	**Healthy / D**	6.95±2.48	7.04±2.54	7.02±2.67	6.87±2.82	7.09±2.7	7.03±2.34
	Injured /ND	2.95±1.8	2.82±1.4	7.35±2.45	5.22±1.8*	6.98±3.2**	7.43±2.52

*p<.05, ** p<.01, ***p<.001

Discussion

In this study, no significant differences were found between the dominant and non-dominant ankles of the control group in all balance tests. These findings were consistent with those of Rein et al (2011), Rein et al (2011B), Cornwall et al (1991) and Mitchell et al (2008), who suggested that the control group's ankles were symmetrical. Although subjects identified their limbs as dominant and non-dominant, the performance of both ankles was similar. Therefore, it seems that no proprioceptive advantage exists when activities are carried out using either dominant or non-dominant limbs (Mitchell et al., 2008).

As far as FB and BB groups are concerned, significant differences in all balance tests between the unstable and stable ankle joint were found at the initial measurements. These results were consistent with the findings of several others studies who have found increased postural sway in ankles with a history of functional instability resulting from ankle sprain compared to healthy contralateral controls (Cornwall and Murrel, 1991; Goldie et al., 1994; Forkin et al., 1996; Akbari et al., 2006; Perron et al., 2007; Nam et al., 2018).

The findings of the initial measurement supported the necessity of application balance exercises in individuals with functional unstable ankle. Rehabilitation exercises to improve postural control include single limb balancing tasks on balance boards, balance disks and electronic balance devices (Mitchell et al., 2008). The present study tries to indicate possible effects of the performance balance exercises on a stable surface. Exercises that can be performed easily, anywhere at no cost.

Functional instability of the ankle is not an acute condition that will lead the injured athlete to visit a rehabilitation specialist. These injured athletes often do not follow a specific exercise program to improve their balance. They are athletes who continue their activity and often lead to another injury. Thus, is very useful to be able to offer them a simple exercise program that they can perform anywhere.

According to the final measurement, both training groups FB and BB significantly improved their performance. After the completion of the rehabilitation programs, no significant differences were found between the stable and unstable ankles in all balance performance indicators. The findings relevant to balance ability improvements in response to balance training agree with previous reports on sedentary individuals (Bernier and Pierrn, 1998; Gauffinet al., 1988; Rozzi et al., 1999). However, the BB group achieved a better improvement in all balance tests performance, suggesting that balance exercise performed on unstable surfaces can improve better the balance ability of individuals with functional ankle instability. It is important, however, that even exercises performed on a stable surface were able to improve balance deficits in functional unstable ankle joints.

CONCLUSIONS

This study suggests that balance exercises improve balance ability in subjects with functional unstable ankles. In the light of the present study results, the research team believe that even exercises performed on a stable surface, with the proper perturbations of the upper body, were able to improve balance deficits in functional unstable ankle joints

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SPECIAL COMMUNICATIONS
Letters to the Editor-in-Chief

Acyclovir Dosage in Prevention of Outbreaks of Herpes Gladiatorum

To the Editor-in-Chief

Dr Gáspár's recommendations addressed the usage of oral acyclovir as a means to treat acute and recurrent outbreaks of Herpes Gladiatorum[1]. Dosages of acyclovir 200 mg 5 times daily for 7-10 days was listed as a means to treat acute outbreaks and 400 to 800 mg daily for recurrent outbreaks. Whereas the usage of acyclovir is acceptable, following the dosing parameters is crucial. PK/PD values of acyclovir metabolism indicate that the drug will peak and clear quickly after ingestion. Which is why dosing every 5 hours is crucial to maintain consistent serum levels. Increasing the dosage will only mean a higher peak but will not maintain consistent serum levels. Lack of appropriate serum levels will allow the virus to potentially persist for a longer period of time. Adding to that the poor compliance which occurs when dosing is > 2-3 times a day2 and you can see that it's difficult to treat and control.

Valacyclovir (which breaks down into acyclovir) has different PK/PD values and allows once to twice a day dosing and still maintain consistent serum concentrations of acyclovir. This is a key point since usage of these drugs are different in this sport than for the general population. Pharma sells the drug with dosing parameters that alleviate the patient's symptoms. Our dosing parameters treat to clear an outbreak and prevent/reduce transmission. These are completely different parameters. In wrestling, we treat and prophylaxis to prevent transmission to other athletes. Whereas ideal usage of acyclovir would be effective, real life situations indicate valacyclovir usage would be a better choice strictly due to convenient dosing parameters.

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B.J. Anderson, M.D.
Boynton Health Service, University of Minnesota, Minneapolis, Minnesota, USA. Medical Advisor for MN/USA Wrestling. Medical Director of Sports Medicine for Augsburg University, Minneapolis, Minnesota. (info@thematdoc.com).

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IN MEMORIAM:
ALEKSANDR VLADIMIROVICH IVANITSKY
October 8, 1937 – July 22, 2020

Ramazan Savranbaşi

MY DEAR FRIEND ALEXANDR,

The pride of the Russians, the great champion ALEXANDER IVANITSKY, was an exemplary athlete in world wrestling, that is, a ROLE MODEL. A state ceremony was held in Moscow yesterday in connection with his death.

ALEXANDER IVANITSKY had recently completed his book "BROKEN EARS", in which he talks about his life and the period over the past 4-5 years. A week before his death, he called me on video and excitedly informed me that his book is now being published. His happiness was evident in his expression. This time, his usual smiling face was different. It was obvious from his manner that he had calmed down after reading the book. He had books that he had written before. However, this book became his farewell book. He said goodbye to his friends, handing over his last book with his hands. His family will send me a book in the coming days. I am also very curious about the content of the book. The title of the book looks so good in a wrestling book. He told me the story of why he named this book "BROKEN EARS." Now I want to share with you.

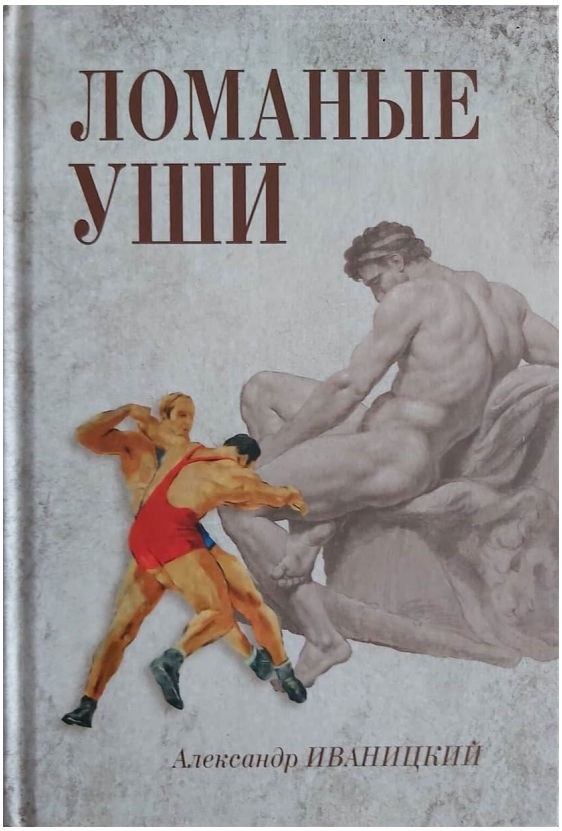
ALEXANDER IVANITSKY (heavyweight) took part in the world championships four times (1962, 1963, 1965 and 1966) and once in the Olympic Games (1964, Tokyo). He wins gold in all these championships. Moreover, he does not give a single point to any opponent!

In 1967 this championship is enough for me and says goodbye to active sports. ALEXANDER graduated from the university in journalism and television. He made an academic career at the same university and began writing books read by more than 3 million people. This situation brings him closer to his goal. He becomes the director of a Soviet-era sports channel, presenter, commentator, programmer and writer for various magazines. He never breaks with his beloved wrestling. He even follows numerous European and world Olympic organizations as a journalist and broadcaster. He is the top press representative at the 1980 Moscow Olympics.

ALEXANDR IVANITSKY gave up active sports, but until his last breath he followed a healthy lifestyle for himself. He was always cheerful and wiry. He constantly played sports according to his age.

One day, 10 years after Alexander gave up wrestling, he went on a regular jog in the forest. After a while, he goes to the fountain and washes himself to cool off. When he straightens his head, he meets the eyes with a young man of 24-25 years old, weighing about 120 kilograms, and suddenly his eyes fall into each other's broken ears. Alexander says to this tall, slender young, athletic youth that you have to be a wrestler. The athlete says yes by expanding the ribcage slightly and adding; I am engaged in wrestling. I am a Master of Sports of the Union of Soviet Socialist Republics). The young wrestler asks curiously, who are you?

ALEXANDR feels that the young wrestler does not know him, and says to the athlete: “I am 4-time world and Olympic champion ALEXANDER IVANITSKY.” The young wrestler does not seem to care about ALEXANDER IVANITSKY, who is over 40, and he says that I cannot remember you. They both say hello and set off in the opposite directions.



ALEXANDR is a little sad on the way home. He criticizes himself and unfortunately says, "We knew that because of our broken ears we were wrestlers, but we didn't know who we were." He makes a promise to himself, saying that the mistake or lack of knowledge, is not in youth, but in us. On the same day, he decides to write a book that will introduce each other to "BROKEN EARS" by writing of the heroes of wrestlers and saying that we must introduce them to the new generation.

ALEXANDR was a lover of nature. The village of Elniki of the Ruzsky District, 125 km from Moscow, where he spent a lot of his life, is located among the forests. The family hosted us here for 5 days on August 15, 2018. He died of a heart attack 5 days ago in the Wayne River, which he entered for bathing, passing through the woods where he used to walk in the woods. My brother Adem Bereket reported the hard news.

ALEXANDR IVANITSKY, looking and examining the book "BROKEN EARS", which he wrote with great difficulty and scrupulousness, was next to his coffin when he said goodbye to life and was distributed there to his beloved.

Have plenty of peace, my dear friend, my dear friend. Sleep in the light, man as man, man as man. Great champion. Wrestling philosopher.

RAMAZAN SAVRANBAŞI

July 30, 2020

INSTRUCTIONS FOR AUTHORS

The *International Journal of Wrestling Science* is the only journal dedicated to the study of the world's oldest sport.
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