EUROPEAN Journal of Physical Education and Sport

Has been issued since 2013.
ISSN 2310-0133. E-ISSN 2310-3434
2016. Vol.(12). Is. 2. Issued 4 times a year

The journal is registered by Federal Service for Supervision of Mass Media, Communications and Protection of Cultural Heritage (Russia). Registration Certificate **ПИ № ФС 77 – 55400** 17.09.2013.

Journal is indexed by: **CrossRef** (UK), **EBSCOhost Electronic Jornals Service** (USA), **Electronic scientific library** (Russia), **Global Impact Factor** (Australia), Open Academic Journals Index (Russia), **ULRICH's WEB** (USA).

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Postal Address: 26/2 Konstitutcii, Office 6
354000 Sochi, Russian Federation

Website: http://ejournal7.com/
E-mail: ejm2013@mail.ru

Founder and Editor: Academic Publishing House *Researcher*

Passed for printing 16.06.16.

Headset Georgia.
Ych. Izd. l. 4,5. Ysl. pech. l. 4,2.

Order № 12.

European Journal of Physical Education and Sport

2016

№ 2

European Journal of Physical Education and Sport

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№ 1

EUROPEAN Journal of Physical Education and Sport

Издается с 2013 г.
ISSN 2310-0133. E-ISSN 2310-3434
2016. № 12 (2). Выходит 4 раза в год.

Журнал зарегистрирован Федеральной службой по надзору в сфере массовых коммуникаций, связи и охраны культурного наследия (Российская Федерация). Свидетельство о регистрации средства массовой информации **ПИ № ФС 77 – 55400** 17.09.2013.

Журнал индексируется в: **CrossRef** (Великобритания), **EBSCOhost Electronic Jornals Service** (США), **Global Impact Factor** (Австралия), **Научная электронная библиотека** (Россия), Open Academic Journals Index (Россия), **ULRICH's WEB** (США).

Статьи, поступившие в редакцию, рецензируются. За достоверность сведений, изложенных в статьях, ответственность несут авторы публикаций.

Мнение редакции может не совпадать с мнением авторов материалов.

Адрес редакции: 354000, Российская Федерация, г. Сочи, ул. Конституции, д. 26/2, оф. 6
Сайт журнала: http://ejournal7.com/
E-mail: ejm2013@mail.ru

Подписано в печать 16.06.16.
Формат 21 × 29,7/4.

Учредитель и издатель: ООО «Научный издательский дом "Исследователь"» - Academic Publishing House *Researcher*

Гарнитура Georgia.
Уч.-изд. л. 4,5. Усл. печ. л. 4,2.
Заказ № 12.

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Published in the Russian Federation
European Journal of Physical Education and Sport
Has been issued since 2013.
ISSN: 2310-0133
E-ISSN: 2310-3434
Vol. 12, Is. 2, pp. 34-40, 2016

DOI: 10.13187/ejpe.2016.12.34
www.ejournal7.com

Articles and Statements

UDC 004.9:796

The Method of Team Sports Athletes' Motor Skills Development

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Abstract

It is proposed that the training session be conducted on the ground with controlled light-dynamic illumination to be generated by small-size laser or other light emitters fastened on the athlete's head. For safety the emitters are to be installed so as to prevent the trainee's eyes from direct emanation.

The emitters create mobile unallowed and allowed zones seen as the figures of various shape to be used for simulation of the training modes. The figures are controlled by software and hardware system including a gyroscopic orientation system of light emitters and a system of positioning of the athlete on the playing court. The system of gyroscopic orientation of light emitters is placed together with the emitters and depending on the head rotation, neck bends and vertical movements of the athlete's head and his/her movements on the playing court during the training session. The system of gyroscopic orientation automatically adjusts the position of the figures, while maintaining their target location and movement set by the selected training programme.

The training can take place outside of specially equipped athletic field, on any smooth surface. The contours of the mobile unallowed and allowed zones are clearly visible and have no shadow formations.

The method of motor skills development proposed incorporates the principles and techniques of sports coaching used for training both certain athletes and sports teams. The method facilitates in personalising the training tasks, acquiring playing skills by simulating different complex game situations, improving the efficiency of training, bringing it closer to the real play conditions, developing game thinking.

The method can be used for training teams of different profile specialising in football, hockey, handball, rugby, basketball and other team sports.

Keywords: athletic games, motor skills, training, principles of training, training areas, methodology of training, individualisation.

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1. Introduction

The performance component is paid much attention to in the game sports activity. This component depends on the proper motor skills and provides the necessary athletic effect (Makarov, 2013). To create such skills multiple drilling reiterations are required but the uniformity and monotony of training sessions is likely to bring the athlete to psychological tiredness, fatigue, loss of interest. Therefore, when choosing the training tools it is necessary to create more possibilities for a positive emotional background to ensure not only high performance, but also a faster recovery after the intense training session (Baikalova and Prostikhina, 2015).

In this regard, the search and study of new methods and techniques of using emotional and accessible motor skills development tools of beginner athletes in order to enhance their level of physical fitness is a necessary prerequisite for improving training programmes in many sports (Maslo, 2010).

Such methods and techniques are essential for both professional sports and the development and changes in the game trends will inevitably entail the changes in the pattern characteristics of the competition activity and, consequently, the athletes of the specific specialisation will not feel comfortable at the training court. In such a situation, the athletes will not be able to participate fully in the play and the effectiveness of their gaming activity will inevitably fall (Makarov, 2010).

The current status of the methods and techniques used for training athletes of sport games based on the information technologies has been considered in the article (Maksimenko, 2009). The prospects for using the multimedia programmes at the first, the second and the third stages of long-term training are discussed in the article. It has been shown that the computer software assists better in game technique mastery, develops tactical thinking and enhances the level of the athletes' theoretical competency.

The issues of the computer information technologies application for technical and tactical training in team sports have been earlier considered by the authors and the method of training technical (Afon'shin et al., 2014; Polevshchikov et all., 2014; Afonshin and Rozhentsov, 2016), tactical actions by means of simulating game situations in the virtual reality (Rozhentsov and Afonshin, 2013) and the technical and tactical training in team sports (Rozhentsov and Afonshin, 2014) have been proposed.

The purpose of the paper is to develop the methodology of motor skills development of a team sports athlete.

The Methods of Motor Skills Development of a Team Sports Athlete

The training session takes place on the ground with controlled light-dynamic illumination to be generated by small-size laser or other light emitters fastened on the athlete's head. For safety measures, the emitters are to be installed so as to prevent the trainee's eyes from direct emanation.

The emitters create mobile unallowed and allowed zones seen as the figures of various shape to be used for simulation of the training modes. The figures are controlled by software and hardware system including the gyroscopic orientation system of light emitters and a system of positioning of the athlete on the playing court. The system of gyroscopic orientation of light emitters is placed together with the emitters and depending on the head rotation, neck bends and vertical movements of the athlete's head and his/her movements on the playing court during the training session, the system of gyroscopic orientation automatically adjusts the position of the figures, while maintaining their target location and movement set by the selected training programme.

For example, when training opposition's groundmoves, the emitters generate around the athlete several light unallowed zones, which are purposefully 'pursuing' the athlete. The athlete's task is to bypass the light rivals, to escape from the encirclement of the unallowed zones. While the athlete is moving, the gyroscopic orientation system of the light emitters captures his/her movements in space and the hardware and software system adjusts the distance between the athlete and the projections of the unallowed zones, therefore there arises a feeling with the athlete that the light opponents are not connected with the emitters located on his/her head, and they act independently according to the programme (Patent…, 2015).

The athlete having done the groundmoves of the light zones is encircled by the light «opposition» again or is given another training task.

The training session can take place outside the equipped playground on any smooth surface. The contours of the mobile allowed and unallowed zones are clearly visible and have no shadow formations.

2. Discussion

The investigations carried out by the experts, according to V.A. Uskov (Uskov, 2004) prove that the basis for effective athletes' training is improving their motor actions. The methodological basis of motor actions enhancing in team sports is (Rodin, 2015):

– introduction of biomechanical control of kinematic characteristics of game skills in the course of practicing competition and training activity, which facilitates in finding the rational playing skill technique; it provides the knowledge of the specifics of the opposition game techniques in the course of individual tactical attacking and defending actions; it contributes to the effective movements control on the basis of the correction of the actions, depending on the opposition's actions.

– introduction of the method of game problems into the training process to identify the game situation and effectively simulate the right decision;

– implementation of the leading demonstration method aimed at enhancing individual technical and tactical players' arsenal in a particular game situation.

The term 'method' in sports training is understood as the method of the basic training tools application and a set of methods and rules for athlete and coach's practices divided into two large groups (Khvorykh and Akbatyrov, 2014):

- general pedagogical methods including verbal and visual ones;
- practical methods including the method of strictly regulated drill, game and competition methods.

The verbal methods applied in sports training include a narration, explanation, conversation, analysis, discussion, etc. They are most often used in a concise form, as special terminology particularly for training highly-qualified athletes. The effectiveness of training largely depends on giving skillfully guidelines, instructions, comments, verbal assessments and clarification.

The visual methods used in sports practice include (Khvorykh and Akbatyrov, 2014):

- the methodologically correct demonstration of the individual drills and their elements, which is usually done by a coach or a qualified athlete;
- demonstration of educational films, video record of the trainees' motor actions, tactical schemes on the training field layouts, playgrounds, etc.;
- use of simple landmarks that restrict the direction of movement, the distance overcome, etc.;
- the use of light, sound and mechanical leading devices, including those computer-controlled and feedback ones. These devices allow the athlete to obtain information on the spatial and dynamic characteristics of the movements and perform their correction.

The effectiveness of training largely depends on the correct application of training methods and devices, on compliance with the specific rules, so-called principles of sports training, which include (Khvorykh and Akbatyrov, 2014):

- integration of general and specialised training;
- continuity of the training process;
- gradual increase in loads and a must of maximum loads;
- waviness of load dynamics, their repeating pattern;
- individualisation of the training tools and methods applied.

In general, training athletes can be considered to be a subject-object in its nature activity, even in cases when it comes to team activities where the final result is the cumulative product of each member personal contribution. The said specifics makes the development of the ways to personalise control of the team sports training system extremely urgent. Thus, the problem of training process individualisation for the active sports teams with an emphasis on the dominance of personality characteristics is of primary importance (Makarov and Khusein, 2010; Losin and Makarov, 2011).

At the present stage, athletic games are in fact a professional occupation and the decisions taken to improve athletes training, according to I.A. Eroshenko et al. (Eroshenko et al., 2012) are to be innovative and focused on the search for fundamentally new methodological approaches to sports training of both individual athletes and teams. The innovative technologies are considered to be a scientific description of those activities in the field of professional sport, which create prerequisites to enhance its level to ensure globally its priority position. At the same time a set of training methods and tools among the technologies is to be laid emphasis on.

On the assumption that the highest sports mastery is a different category, one ought to have specific training methods in addition to the traditional ones (Eroshenko et al., 2012):

– the principle of training load sufficiency (first of all, it allows one to forecast the sporting longevity and manage it, secondly, the training time saved can be used to the best effect);

– the principle of impact loads;

– the principle of focused specialization of the training loads;

– the principle of variability of training impact;

– the principle of compliance of the training loads to the nature of competition activity.

Therefore, the innovative approaches to training teams of athletic games are to include (Eroshenko et al., 2012):

- improving young athletes' individual proficiency in an extended range of game actions;

- increase in the variability of the tactical team actions;

- enhancing the basic level of athletic training focused on the development of power-speed qualities and specialised endurance.

Taking into account the specificity of the athletic games it is necessary that following athletes' training problem should be tackled (Rodin, 2015):

- improving the ability to coordinate one's movements and actions, taking into account the direction and speed of the implement motion (differentiation of space and time relations);

- development of the specialized physical abilities, mainly strength and speed of muscle contraction;

- development of complex responses speed, visual orientation, observation skills, tactical thinking and other skills that influence over the success of the game techniques application.

3. Conclusion

The developed method of motor skills improvement comprises the principles of sports training of individual athletes and athletic game teams. It facilitates in personalising the training tasks, acquiring game skills by simulating different complex game situations, improving training efficiency, bringing it closer to the real game conditions, developing game thinking.

The method can be used for training teams of various proficiency level, specializing in football, hockey, handball, rugby, basketball and other team sports.

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УДК 004.9:796

Метод развития двигательных навыков спортсмена в игровых видах спорта

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Аннотация. Тренировку спортсмена предлагается проводить на площадке с управляемой светодинамической подсветкой, которая создается малогабаритными лазерными или иными излучателями света, закрепленными на голове спортсмена. Для обеспечения безопасности излучатели устанавливаются так, чтобы исключить прямое попадание излучения в глаза тренирующегося.

Излучатели формируют мобильные запрещенные и разрешенные зоны в виде различных фигур, с помощью которых моделируют режимы тренировок. Управление фигурами осуществляется программно-аппаратным комплексом, который содержит систему гироскопической ориентации световых излучателей и систему определения координат спортсмена на игровом поле. Система гироскопической ориентации световых излучателей размещается совместно с излучателями и в зависимости от поворотов, наклонов и вертикальных перемещений головы спортсмена, а также его перемещений по игровому полю во время тренировки, автоматически корректирует положение фигур, сохраняя их целевое расположение и перемещение, заданное выбранной программой тренировки.

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Тренировка может проводиться вне специально оснащенной спортивной площадки на любой ровной поверхности. Контуры мобильных запрещенных и разрешенных зон хорошо видны и не имеют теневых образований.

Предложенная методика развития двигательных навыков учитывает принципы и направления спортивной тренировки при подготовке как отдельных спортсменов, так и команд по спортивным играм. Она позволяет индивидуализировать тренировочные задания, приобретать игровые навыки, моделируя различные по сложности игровые ситуации, повышать эффективность тренировки, приближая ее условиям, близким к игровым, развивать игровое мышление.

Методика может использоваться при подготовке команд разной квалификации, специализирующихся в футболе, хоккее, ручном мяче, регби, баскетболе и в других командных видах спорта.

Ключевые слова: спортивные игры, двигательные навыки, тренировка, принципы тренировки, направления тренировки, методика тренировки, индивидуализация.

Published in the Russian Federation
European Journal of Physical Education and Sport
Has been issued since 2013.
ISSN: 2310-0133
E-ISSN: 2310-3434
Vol. 12, Is. 2, pp. 41-45, 2016

DOI: 10.13187/ejpe.2016.12.41
www.ejournal7.com

UDC 004

The Effectiveness of the Usage of the Interactive Method in the Development of Certain Basic Competencies in Handball for Pupils (12-13) years old

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Abstract

This study's aim is to identify the effectiveness of the Interactive Method in the development of some competencies related in Handball (normal transmission, the reception of transmissions, done until the zone of the opponent), where an experimental method with its two types (pre-test and after-test) has used for the pupils of middle school in Mostaganem – Algeria. The 24 pupils (12-13) years, were divided into two groups, a basic group of 12 pupils and an experimental group of 12 also. The second group was divided into two groups of six and each one we have three categories: the weak, the average and the good ones. In order to collect information, researchers have used competencies tests and the formation program suggested in order selecting a referee from the teachers. The results have shown that the Interactive Method helped in the progress of competencies mentioned in the study. Therefore, researchers recommend giving a higher importance in the new methods of teaching related to skills.

Keywords: interactive method, basic competencies, handball.

1. Introduction

Learning is considered as the most important way to develop populations due to its positive role in preparing the new generation for the future by providing a new, solid, scientific base. Many ways, tools and teaching theories have been suggested and presented in order to help these populations to progress and fulfill their aims (Mauston, Ashworth, 1994: 9)

As for the teacher's role in this study, they must push the pupils to learn by using many different ways and methods which require his full attention to their effectiveness in the learning process of each pupil (Affaf Abdelkarim, 1994: 3)

It is known that the learner is the main part in the learning process and it is very important to develop his capacities which require the teacher's full attention in order to give him the opportunity to progress his sports abilities and performance.

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Singer (1995) and Affaf Abdelkarim (1994) have indicated that the teacher should deal with many learning methods and strategies in order not to be shackled with one method which has a negative impact on his outcome.

Interactive Method is considered as a modern way of learning because it helps the learners to work in pairs. During his process, pupils learn to work with their classmates by exchanging roles and taking the full responsibility of their learning in order to process and succeed. Learners influence each other's behavior by exchanging roles (Salvin, 1995: 13).

Handball is one of the collective games that dealt with the modern way of learning which develops the team's skills. These skills have become dynamic and exciting especially with the defense and the offense skills. It is viewed as a very rich game known for its artistic skill such as passing on, hitting, shooting and taking the ball in which feet play a big role.

The goals of learning are set of the strategies of education in which the nature of humans and the changes that happen in the society are taken into consideration. The influence of the pressure of technology and the scientific progress in the educational field also takes a major role in preparing the future generation to be functional members in the modern life (Buschner, 1994: 4).

Handball takes part in the learning takes based on the body movements which goes from the easy to the difficult and from the simple to the complex. These skills rely on each other in Handball in which each skill outcome depends on the other. The teaching strategy helps to make the learning process successful due to the positive way of dealing with those movement skills needed to teach and develop (Hamdan, 2011: 2).

During our observation inside middle schools, we found that there is a weakness concerning pupil's competencies, and there is no application of certain pedagogical aims of the program in relation to the program which use to teach Handball competencies. This weakness has a relation to time limitation and the short period of the semester or the learnt itself, in addition, the huge number of pupils has an effect on the teacher who is obliged to control pupil's practices and correct their mistakes, that is why he needs much time to do all these (Smith, 1991: 14).

Some researches viewed that the use of Interactive Method strategy is more important in teaching as an act of facing certain circumstances related to learning according to physical competencies in general.

The use of this strategy will help to rich the learning operation and help pupils in mastering certain basic competencies in Handball in order to have an excellent level of practice to face the practical part of society.

2. Methodology

2-1- The method of the study:

This study, based on the experimental method as a strategy by using two groups. One is basic and the other is experimental.

2-2- Sample:

In the study, there is a selection of 24 pupils from the population of fourth year middle school in Wilaya of Mostagenem – Algeria. This sample is chosen at random.

2-3- Instruments of the study:

In order to have an accurate result, the study based on test and the use of certain competencies in the field. Then, it used some materials as Plyometric exercises and pedagogical tools to practice the educational units which proposed. In addition, some Arabic, French and English references are used in this study.

2-4- Statistic instruments:

*Student Equation - Person Coefficient of simple connection – Normative Aberrance – Arithmetic Medial

Test: this study used three different tests concerning Handball.

Dribbling the ball 30m – The Shoot on the goal - Scrolling and receiving.

2-5- The Experiment:

During the lectures, all the materials and tools are used except the program of learning certain Handball competencies (which is our aim) by following the Interactive Method strategy for the experimental group and shed the light on the age of this group members unlike the basic group under the supervision of a teacher.

Researchers have divided the experimental group into two groups; each group is composed of two pupils with different roles for each member as follows:

1-the leader of the group: is the responsible who guides his classmates to realize their aims.

2-An exemplar (the model): who practices the competence model for the others.

3. Results

We note from the table (01), the presence of significant differences between the pre and post measurement in favor of telemetric in the normal transmission test with the experimental and control samples where the estimated calculated T is respectively 3.26 and 2.82. It is the largest of the estimated tabular by 2.201 at the level of 0.05 and the degree of freedom 11.

Table 1. Descriptive table statistical comparisons between the pre-test and post-test results in Dribbling the ball 30m

Statistical measurements / Sample	Post-test		Pre-test		T Tabular	T Calculated	Statistical significance	Percentage of progress
	X1	Y1	X1	Y1				
Experimental	**8.1**	**1.41**	**6.4**	**0.82**	**3.26**		Significant	37.17%
Control	**8.8**	**1.4**	**5.6**	**0.7**	**2.82**	**2.201**	Significant	11.42%

We note from the table (02), the presence of significant differences between the pre and post measurement in favor of telemetric in the dome until the zone of component test with the experimental and control samples where the estimated calculated T is respectively 4.74 and 3.53. It is the largest of the estimated tabular by 2.201 at the level of 0.05 and the degree of freedom 11.

Table 2. Descriptive table statistical comparisons between the pre-test and post-test results in the Shoot on the goal

Statistical measurements / Sample	Post-test		Pre-test		T Tabular	T Calculated	Statistical significance	Percentage of progress
	X1	Y1	X1	Y1				
Experimental	15.3	2.6	17.8	3.4	4.74*		Significant	35.71 %
Control	12	1.8	19.2	2.6	3.53*	2.201	Significant	10 %

We note from the table (03), the presence of significant differences between the pre and post measurement in favor of telemetric in the reception of transmission test with the experimental and control samples where the estimated calculated T is respectively 5.71 and 3.72. It is the largest of the estimated tabular by 2.201 at the level of 0.05 and the degree of freedom 11.

Table 3. Descriptive table statistical comparisons between the pre-test and post-test results in Scrolling and receiving

Statistical measurements / Sample	Post-test		Pre-test		T Tabular	T Calculated	Statistical significance	Percentage of progress
	X1	Y1	X1	Y1				
Experimental	36.16	1.42	40.7	1.14	5.71*		Significant	48.82%
Control	37.7	1.42	42.7	2.27	3.72*	2.201	Significant	12.5%

It is observed from the table 4 after the use of test T student that ranges between 3.82 and 4.63, the largest values of tabular T are estimated at 2.07 at a degree of freedom 22 and the significance level is 0.05. It confirms the existence of significant differences between the averages of any developments, which means that the differences between the averages have statistical significance.

Table 4. Illustrates the significance of the differences between the menstruations the remoteness of control and experimental samples

Statistical measurements / Tests	Experimental sample		A control sample		T Tabular	T Calculated	Statistical significance
	X1	Y1	X2	Y2			
Dribbling the ball 30m	7.9	0.54	10.3	3.06	3.95	2.07	Significant
The Shoot on the goal	17.8	0.04	14.2	0.06	4.63		Significant
Scrolling and receiving	39.7	2.74	32.7	2.67	3.82		Significant

4. Discussion

This study's aim is to identify the effectiveness of the Interactive Method in the development of some competencies related in Handball (Dribbling the ball 30m – The Shoot on the goal – Scrolling and receiving).

The use of this new strategy for learning helped in motivating pupils to learn and to have an idea about how to form groups based on their competencies and background in this field. In this sense, Johnson. D.W said that pupils learn more when they exchange the learning roles with each other.

Researches view that the Interactive Method strategy based on the practice with the help of the more competence learners to the less competence ones in order to have a good level of learning. They also view that the uses of new strategies in learning help learners to understand, to apply their competencies freely, being creative and the most important thing to develop the collective work.

To sum up, Slavin (1995), Majed Abid (2006) and Smith Karl (1991), the cooperative learning strategy has a positive effect on the relation between pupils of high competency' level.

5. Conclusion

In the light to tools and instruments which have been used in this study and from the results and findings, which have been found, we conclude to the method of the Interactive Method program had a good affection on this research. There are differences between both tests for the experimental group rather than the basic group. There are differences between both groups in after the test for the experimental group. The interactive method is the best method in the development of certain basic competencies in handball.

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Published in the Russian Federation
European Journal of Physical Education and Sport
Has been issued since 2013.
ISSN: 2310-0133
E-ISSN: 2310-3434
Vol. 12, Is. 2, pp. 46-57, 2016

DOI: 10.13187/ejpe.2016.12.46
www.ejournal7.com

UDC 004

A Simple and Objective Method for Analyzing a Gymnastics Skill

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Abstract

The traditional approach to evaluate gymnastics by subjective rating requires an experienced eye, posing challenges to teachers and coaches who may not have the necessary personal experience. This study presented a simple and objective method for analyzing a dynamic, asymmetrical and multi-planar gymnastics skill (cartwheel). Two studies were conducted to analyze videos of cartwheel performances by quantifying ankle, knee, hip, shoulder, and torso angles using an open source freeware. Study 1 tested whether the method could differentiate between highly trained gymnasts and novices, and assessed the reliability of the method. Study 2 evaluated whether the method could track the progression of novice learners: Performances of an experimental and a control groups were compared before and after a 20-minute intervention. Results showed excellent intra- and inter-rater reliability (intra-class correlation > 0.90, standard error of measurement < 5°). Highly trained gymnasts displayed better forms than novices at the ankle, knee, shoulder and torso (all $p < 0.05$). After brief practice, novel learners showed improvements at the knees ($p = 0.007$) and ankles (group × time $p = 0.05$) when performing a cartwheel. In conclusion, the proposed video analysis method demonstrated good potential for assessing the cartwheel in a simple and objective way.

Keywords: cartwheel, video analysis, reliability, skill level, learning.

1. Introduction

Gymnastics is a core component in physical education (PE) programmes and extra-curricular activities in many education systems worldwide (Napper-Owen et al., 1999; Pajek, Tursic, 2010; Quill, Clarke 2005). Assessment of a gymnastics skill is generally performed by a teacher, coach, or judge, who rates the skill according to its aesthetic appeal as it is executed (Hein, Kivimets, 2000; Heinen et al., 2009; Sadowski et al., 2009; Smith et al., 2003). The aesthetic appeal of gymnastics is closely related to movement form such as pointing the toes and extending the knee. Evaluation of gymnastics by rating, though commonly practiced, is highly subjective and requires an experienced eye to evaluate the skill quickly and accurately (Pizzera, 2012). This poses challenges to many PE teachers and some coaches who may not have the necessary gymnastics background to identify performance errors based on personal experience (Ste-Marie, 2000).

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To overcome the problem of subjectivity and the lack of experience, biomechanical analysis can provide an objective and precise solution to evaluate gymnastics skills through the use of videos, motion capture system and computational analysis software. For example, motion capture systems which track the trajectories of retro-reflective markers placed on the body have been used to analyze gymnastics' high bar performance (Cagran et al., 2010; Hiley et al., 2007). Video analysis coupled with force measurements provided insight into the technique of the circles on pommel horse (Fujihara et al., 2009). Good attempts have been made to incorporate biomechanics in judging gymnastics by use of video analysis, timing gates and computer algorithm (Sands, McNeal, 1999). Recently, a new algorithm was proposed to automatically recognise body movements from video recordings with an aim to aid scoring of rhythmic gymnastics movements (Díaz-Pereira et al., 2014). The scores computed by the algorithm were comparable to those assigned by expert judges for a few standard gymnastics movements. However, these biomechanical and computational approaches often require specialised equipment and are too complex and time consuming for teachers and coaches to incorporate into their practices. Thus, simpler quantitative analysis methods will better assist PE teachers and gymnastics coaches to identify and correct performance errors. Simple evaluation methods can also offer an opportunity for students to perform self-check and peer assessment to enhance learning experience in cognitive, psychomotor and affective domains (Baumgarten, Pagnano-Richardson, 2010; Johnson, 2004; Nilges-Charles, 2008).

The use of simple two-dimensional (2D) video analysis has proved to be a promising alternative for evaluating gymnastic movements effectively. Siatras (2011) presented a technique of skill analysis by measuring body segmental angles during a static strength element (V-sit) using digital photography and computer-aided image analysis. Rosamond and Yeadon (2009) utilized 2D video analysis of the backward handspring to design a safe and practical training aid to assist skill learning. These previous studies, however, analysed only static positions (e.g. V-sit) or bilaterally symmetrical movements that occur in one plane (e.g. back handspring). Since many gymnastics movements are dynamic, asymmetrical, and multi-planar in nature, there is a need to develop user-friendly methods for quantitative analysis of more complex skills. Such methods can support student learning by using technology to provide feedback and to document improvement over time (Bonnie, Thompson, 1997)

Therefore, the aim of this study was to develop a simple and objective method to analyze a dynamic, asymmetrical and multi-planar gymnastics skill – the cartwheel. The cartwheel was chosen to illustrate this method because (a) it is an asymmetrical skill that occurs in multiple planes, (b) it is a skill frequently taught in PE curriculum in schools, and (c) it is a common fundamental skill in many acrobatic activities including gymnastics, dance and martial arts. The proposed method would involve affordable equipment and straight forward analysis procedures to evaluate cartwheel performances. It was hypothesized that this method would be sufficiently reliable, and able to differentiate various skill levels as well as to track learning progression among novices.

2. Methods

Two studies were conducted to develop and to evaluate a video analysis method. Ethical approval was obtained from the university research ethics committee. Prior to any procedures, all adult participants provided written informed consent. For minor participants, written parental consent together with minor ascent were obtained.

Study 1: Differentiating skill levels

This study was designed to test whether the proposed video analysis method could successfully differentiate various skill levels. The cartwheel performances between highly trained and novice gymnasts were compared. Since differences in performance were expected between these two groups, this comparison served to examine whether the proposed method was effective in identifying the expected differences.

Participants. Five male national-level gymnasts [Mean (*SD*) age = 23.8 (8.4) years, height = 1.69 (0.05) m, body mass = 64.8 (6.6) kg] and 17 novices with little or no prior gymnastic experience [13 men, 4 women, mean (*SD*) age = 24.9 (4.7) years, height = 1.70 (0.07) m, body mass = 65.3 (9.3) kg] were recruited to participate in the study. The highly trained gymnasts have had at least seven years of training experience and competed at national or international levels.

*Procedures***.** After performing self-selected warm-up, the participants were instructed to perform a cartwheel starting from a standing position. A single camcorder (Sony DSR-PD170P) was used to record the cartwheel performances at a frame rate of 50 Hz. The camcorder was positioned at the end of the mat along the direction in which cartwheel was performed (see Figure 1(a)). This camera position was set to capture the side view of the participants when they were near an inverted position during a cartwheel (see Figure 1(b)). No calibration procedures were required. Only one trial was recorded per participant to replicate a realistic PE lesson in which a teacher may need to evaluate over 40 students within 50 minutes (excluding post-possessing time).

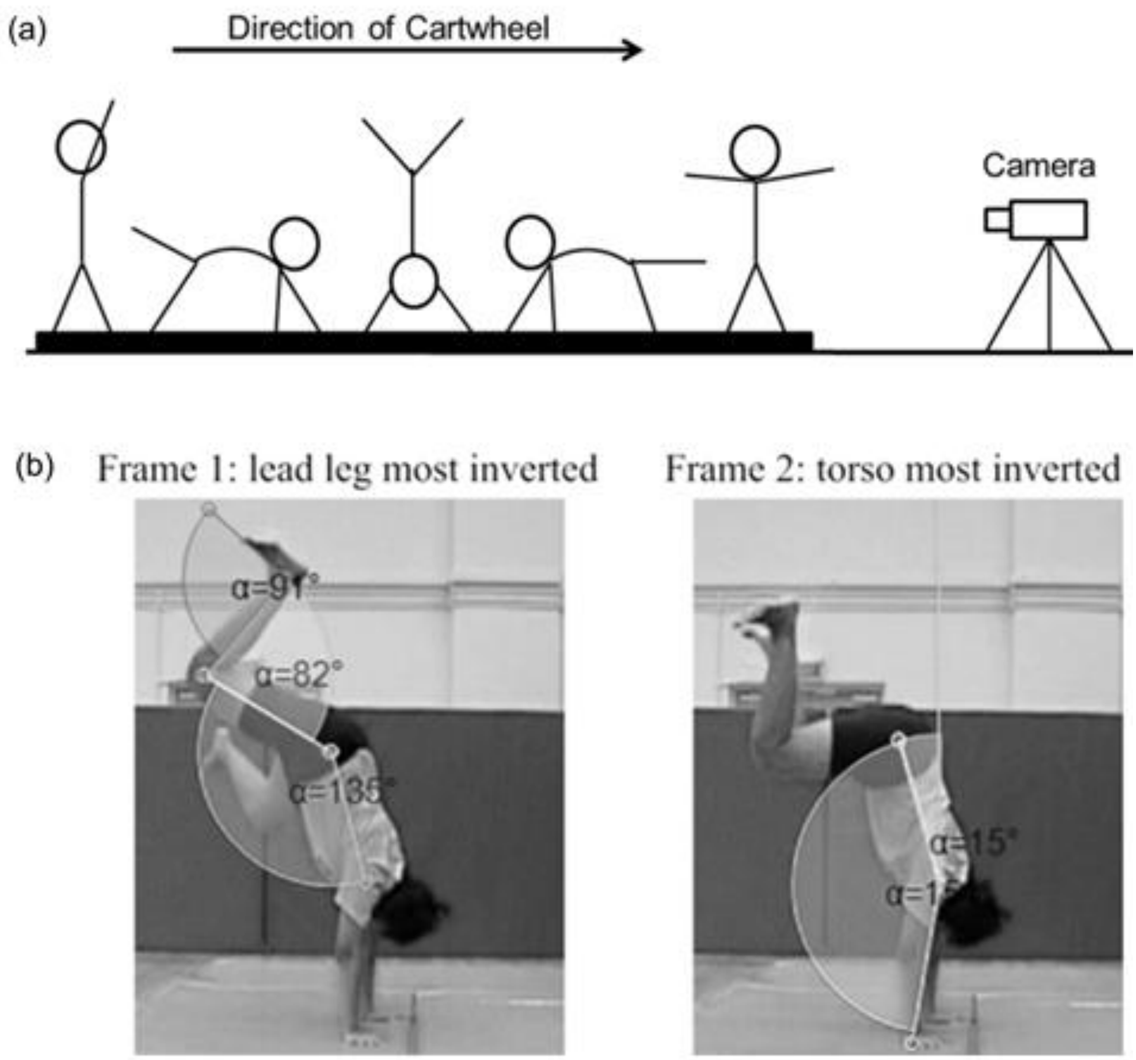

Figure 1. (a) Experimental set-up for video recording of cartwheel performances with a single camera. (b) Cartwheel videos were manually digitized in two selected frames. Frame 1: the lead leg was most inverted (measurement of ankle, knee and hip angles). Frame 2: the torso was most inverted (measurement of the shoulder and torso angles).

The videos were then analyzed using an open source freeware for motion analysis. Two frames in each video recording were selected for manual digitization – frame 1 at which the leading leg was most inverted and frame 2 at which the torso was most inverted (see Figure 1(b)). In frame 1, the participant's ankle, knee, and hip joint angles were measured by digitizing the toes and the joint centers of the knee, hip, and shoulder. In frame 2, the shoulder joint angle and the degree of tilt of the torso from the vertical were also measured. The time at which frame 1 and frame 2 occurred were also recorded. Selection of these two frames allowed simple 2D video analysis for a multi-planar movement because the body angles to be measured can be assumed to lie in a plane perpendicular to the optical axis of the camera. We chose to analyze only absolute (torso) or relative (ankle, knee, hip and shoulder) angles but not spatial variables (e.g. distance) so that no calibration was required. These procedures involve basic and affordable equipment, free computer software, and minimal manual processing of data.

Reliability. To assess intra-rater reliability, all 22 videos were digitized twice by the same rater (Rater 1) with an interval of seven days between repeated digitization. This rater has a degree in sports science and no formal training in gymnastics. The videos were also digitized by two other raters (Rater 2 and Rater 3) independently for the inter-rater reliability analysis. Rater 2 was a former gymnast in the junior national team. Rater 3 did not have any gymnastic experience and could not perform a cartwheel. The purpose of the study was blinded to all raters to avoid bias.

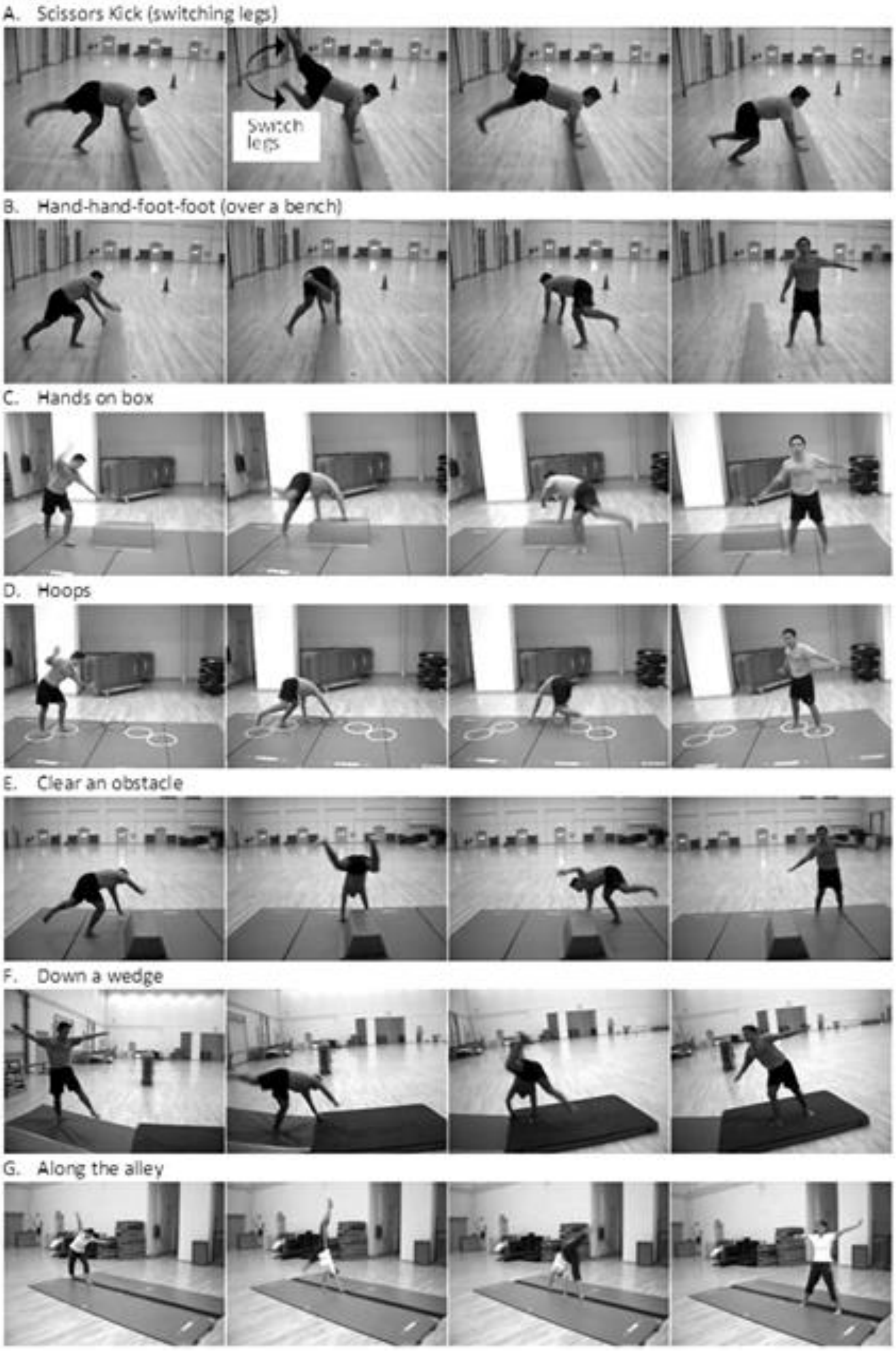

Figure 2. Participants in the experimental group (n = 9) practiced seven drills to promote better cartwheel techniques during a 20-minute intervention

Study 2: Tracking learning progression

This study was designed to evaluate whether the proposed video analysis method could identify changes in performance with learning. Cartwheel performances of novices were compared before and after an intervention comprised of cartwheel-related or other gymnastics drills.

Participants. Seventeen novices were conveniently sampled from a group of trainee teachers enrolled in a 'Curriculum Gymnastics' module. The participants were randomly assigned to an experimental [n = 9, 5 men and 4 women, mean (*SD*) age = 24.3 (4.3) years, height = 170.1 (7.8) cm, body mass = 65.0 (10.1) kg] and a control [n = 8 males, mean (*SD*) age = 25.6 (4.8) years, height = 170.3 (5.3) cm, body mass = 65.6 (7.6) kg] groups. All participants had minimal experience in gymnastics.

Procedures. The equipment and set-up were identical to those described in Study 1. After warming up, all participants performed a cartwheel from a standing position and their movements were recorded by a camcorder (pre-intervention). Thereafter, participants were split into their corresponding groups for 20 minutes of practice before performing another cartwheel for the post-intervention analysis. This intervention duration of 20 minutes replicates the activity time available in a single lesson period (approximately 30 minutes) in most schools in Singapore.

Participants in the experimental group practiced seven cartwheel-related drills (see Figure 2) in rotational sequence, for a total of 10 minutes. They were then given 10 more minutes to practice any of these drills of their choice. These drills were specifically designed to improve the cartwheel movement by emphasizing various important elements, such as extending the hips, correct sequencing and positioning of the hands and feet, and getting the torso to an inverted vertical position. Similar drills have been used in previous research to facilitate learning of a cartwheel among participants with no gymnastics experience (Smith et al., 2003). Participants in the control group were given 20 minutes to practice five general gymnastics drills in rotational sequence – handstand facing the wall, balancing along an inverted bench, forward or backward rolls down an inclined wedge, tripod stand or half headstand, and a mini-routine involving balance and roll elements. After the 20-minute intervention, the cartwheel performances of participants from both groups were video recorded again.

All cartwheel videos were digitized by Rater 1 using the same procedures described in Study 1. In order to prevent bias, the study design and the assignment of participants to the experimental or control groups were unknown to the rater.

Statistical analysis

Statistical analysis of data was done using IBM SPSS Statistics 21 (Chicago, IL) and Microsoft Excel. There were five dependent variables, comprising the ankle, knee, hip, shoulder and torso angles. Inter-rater and intra-rater reliability were evaluated using intra-class correlation (ICC) values, standard errors of measurement (SEM) values and Bland and Altman plots. The times at which frame 1 and frame 2 were identified were also compared within and between raters. For Study 1, the Mann-Whitney U test was used to compare the cartwheel performances between the highly trained gymnasts and the novices. For Study 2, a 2 × 2 (group × time) Analysis of Variance with repeated measures was used to examine the effect of practicing cartwheel drills on each of the selected angles. The within-group factor was time (pre versus post) and the between-group factor was group (experimental versus control). Data are presented in means (standard deviations). Statistical significance was set as 0.05 throughout.

3. Results

Reliability analysis

Intra-rater reliability was excellent (ICC = 0.96 to 1.00, SEM = 1° to 3°, see Table 1). Rater 1 was very consistent in the identification of frames 1 and 2 – the exact frames were selected on both days in 32 out of 44 trials, and the remaining 12 trials differed by just 1 frame (0.02 s). Furthermore, a visual inspection of the Bland Altman plots showed random scatter of the points between the limits of agreement, indicating homoscedastic data as well as an absence of systematic bias (see Figure 3).

Table 1. Intra- and Inter-rater Reliability of Video Analysis of Cartwheel Performances

Angles		Mean (day 1)	Mean (day2)	Mean difference	ICC	SEM	95% Limits of Agreement	
							Lower	Upper
Ankle	Intra-rater	126	125	-1	0.98	3	-10	8
	Inter-rater	129	/	/	0.95	5	/	/
Knee	Intra-rater	149	148	-1	1.00	2	-5	5
	Inter-rater	147	/	/	0.99	3	/	/
Hip	Intra-rater	172	173	1	0.97	3	-8	9
	Inter-rater	171	/	/	0.92	5	/	/
Shoulder	Intra-rater	153	152	-1	0.96	3	-10	7
	Inter-rater	155	/	/	0.92	5	/	/
Torso	Intra-rater	17	17	0	0.99	1	-4	4
	Inter-rater	15	/	/	0.93	3	/	/

Note. Mean difference was calculated from day 2 – day 1. ICC = intra-class correlation, SEM = standard error of measurement.

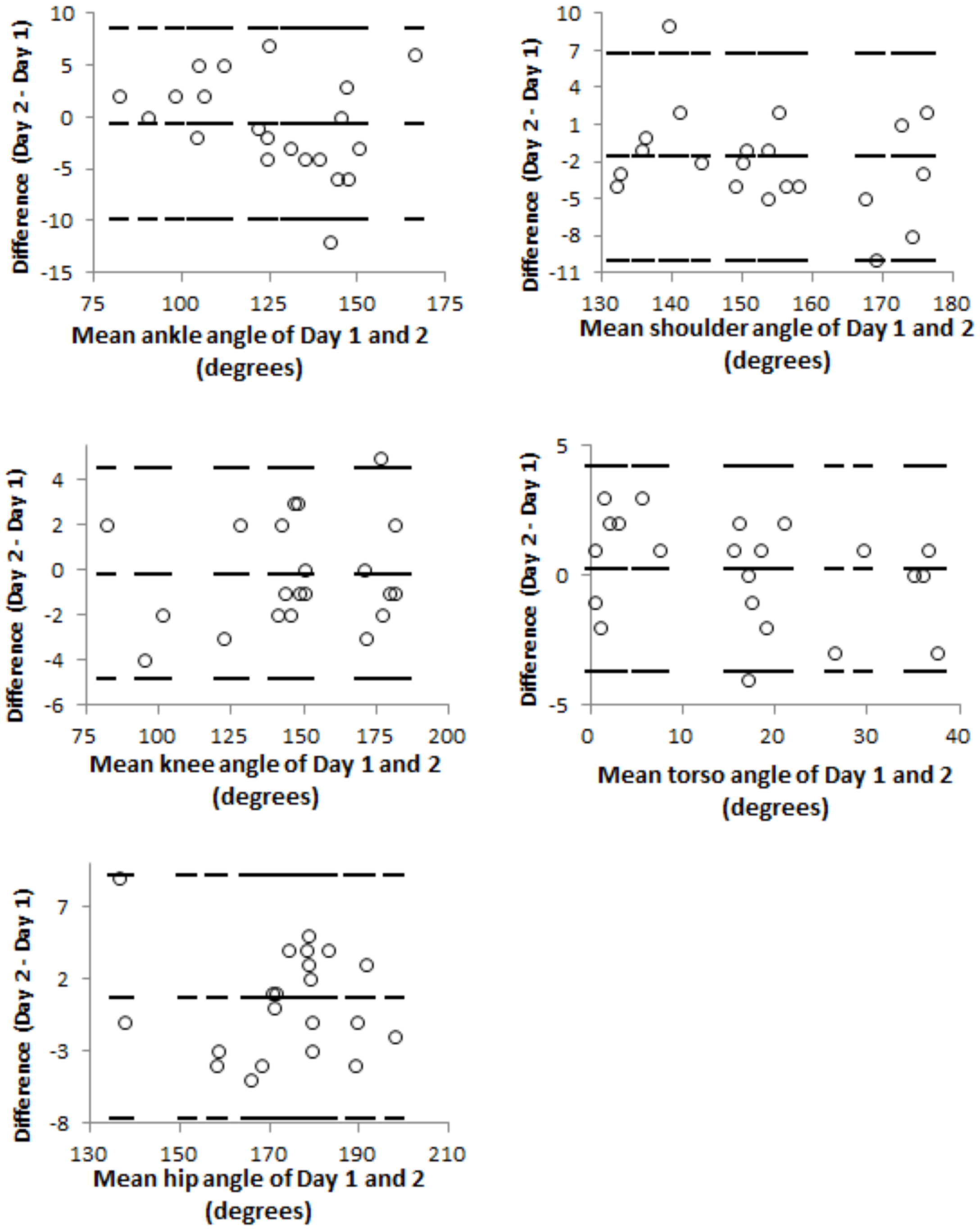

Figure 3. Bland-Altman plots for the ankle, knee, hip, shoulder and torso angles digitized seven days apart by the same rater.

Inter-rater reliability was also excellent (ICC = 0.92 to 0.99, SEM = 3° to 5°, Table 1). Regarding the identification of frames 1 and 2, the exact frames were selected in 16 out of 44 trials among the three raters with varied gymnastics abilities. The selection of frames generally differed by 1 to 2 frames (0.02 to 0.04 s). Only 2 out of 44 trials had the maximum discrepancy of 3 frames (0.06 s) among the raters.

Study 1: Differentiating skill levels

The Mann-Whitney U test revealed significant differences ($p < 0.05$) between the two groups of participants of different skill levels in all measured angles except the hip (see Table 2). Compared to the novices, the highly trained gymnasts are characterized by more pointed toes, greater extension at the knee, greater flexion at the shoulder as well as a more inverted torso.

Typical cartwheel performances of a highly trained gymnast versus a novice at the two selected video frames are compared in Figure 4.

Table 2. Comparison of Cartwheel Performances [mean (standard deviations)] between highly trained gymnasts and novices

Angles	Highly Trained Gymnasts (degrees)	Novices (degrees)	Statistical Results
Ankle	151 (7)	117 (20)	U = 1.50, Z = -3.18, *p* = 0.001*
Knee	177 (4)	137 (26)	U = 4.50, Z = -2.93, *p* = 0.003*
Hip	180 (11)	169 (17)	U = 26.50, Z = -1.26, *p* = 0.209
Shoulder	174 (3)	147 (13)	U = 2.00, Z = -3.18, *p* = 0.001*
Torso	1 (1)	21 (12)	U = 4.50, Z = -2.98, *p* = 0.003*

*Statistical significant differences (p < 0.05).

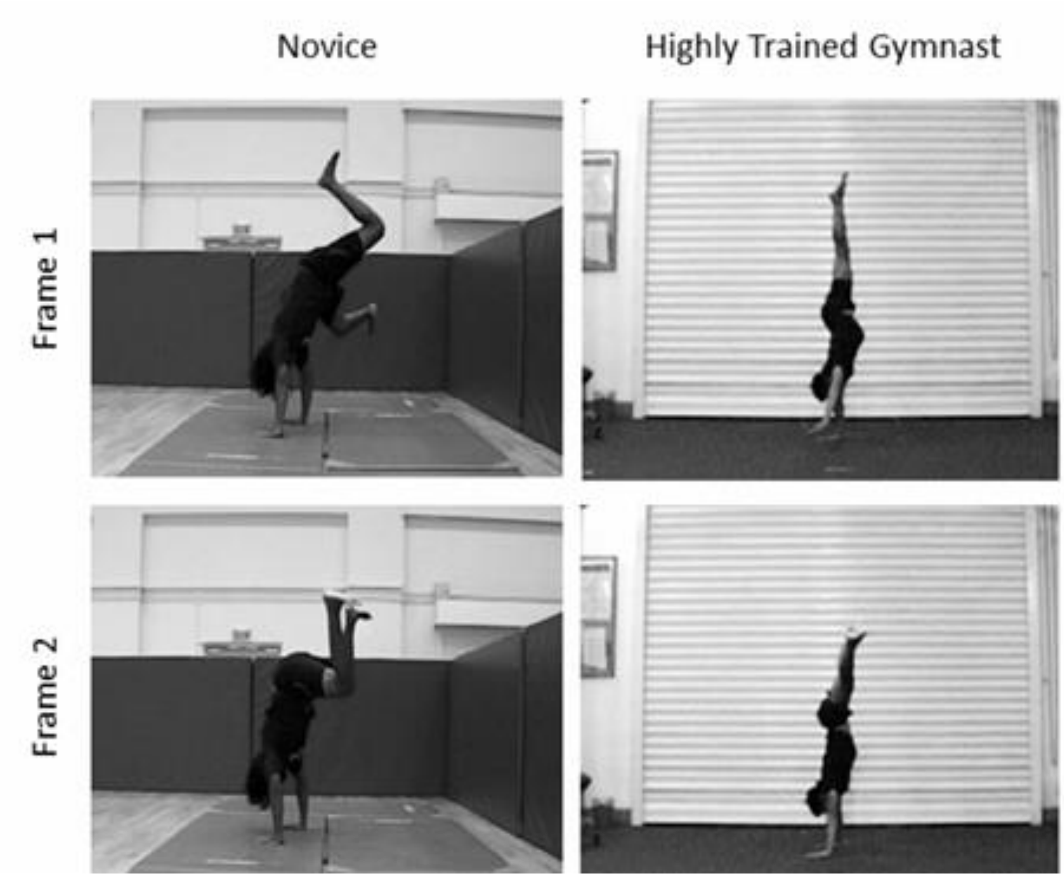

Figure 4. Comparison of cartwheel performances between a typical novice and a highly trained gymnast at two selected frames for digitization (frame 1: leading leg most inverted, frame 2: torso most inverted).

Study 2: Tracking learning progression

Analysis of Variance revealed no differences in all measured angles between the experimental and control group (see Table 3). After the intervention, participants from both groups showed significant improvements in extending the knee (*p* = 0.007). For the ankle angle, there was a significant group × time interaction (*p* = 0.05) with improvements in pointing the toes only seen in the experimental group but not the control group. Individual plots of the changes in angles before and after the intervention are shown in Figure 5.

Table 3. Comparison of Cartwheel Performances [mean (standard deviations)] Pre- and Post-Intervention

Angles		Control (degrees)	Experimental (degrees)	*p*-values Group	Time	Group × Time
Ankle	Pre	122 (6)	115 (8)	0.833	0.035*	0.050*
	Post	123 (8)	134 (8)			
Knee	Pre	133 (13)	140 (7)	0.827	0.007*	0.344
	Post	152 (10)	150 (7)			
Hip	Pre	167 (8)	170 (5)	0.860	0.184	0.830
	Post	172 (7)	173 (5)			
Shoulder	Pre	143 (7)	148 (3)	0.275	0.588	0.190
	Post	141 (7)	153 (3)			
Torso	Pre	24 (5)	19 (3)	0.199	0.128	0.274
	Post	23 (5)	14 (2)			

*Significant main effect detected by Analysis of Variance ($p < 0.05$)

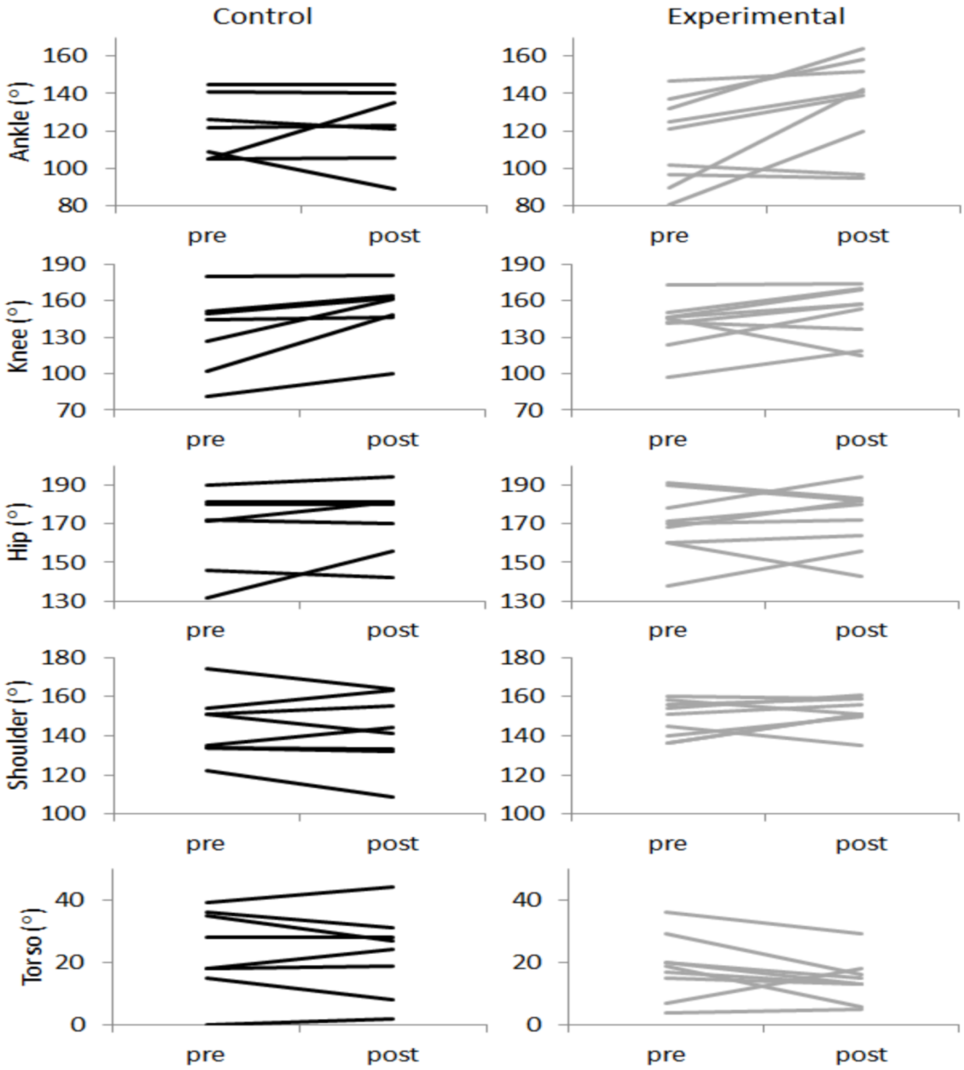

Figure 5. Changes in angles of individual participants (experimental n = 9, control n = 8) before and after a 20-minute intervention.

4. Discussion

This study presented a new method of analysing a dynamic, asymmetrical and multi-planar gymnastics movement using affordable equipment, free computer software, and simple processing procedures. As hypothesized, this objective method has shown to be reliable and effective in differentiating between different skill levels as well as tracking learning progression.

The intra-rater and inter-rater reliability analyses revealed excellent repeatability overall, with very few discrepancies in the identification of the required video frames. The good agreement among the three raters with different gymnastics abilities suggests that the proposed method can be readily adopted by coaches, teachers and students regardless of their personal experience. While the use of holistic rubrics remains a sound and effective way in assessing gymnastics (Johnson, 2004; Nilges-Charles, 2008), the simple analysis method proposed in this study provides an alternative means to support teacher, self and peer assessment. The use of video technology in PE and sport settings can overcome the limitation of subjective judging which requires one's own sensorimotor experience to accurately assess the complex movement patterns in gymnastic skills (Pizzera, 2012) and also provide students with opportunity to receive feedback and reflect on their performances (Mohsen & Thompson, 1997). Given that only basic equipment and simple procedures are needed to perform the proposed video analysis, PE teachers and coaches can easily engage students to do self or peer evaluation. Involving students in assessment will not only reduce the burden on the teachers and coaches but also enhance student learning experience (Johnson, 2004; Nilges-Charles, 2007). In a study of selected gymnastics skills (handstand, forward and backward rolls), it has been proposed that including additional students in the evaluation process can raise the objectivity of the ratings (Rasidagic, 2014). Considering the rapid development of mobile phone technology in recent years, many students may have access to a phone which can record high quality videos. There are also free or affordable apps which allow frame-by-frame video analysis including the 2D angles proposed in this study. Thus, it deems plausible to incorporate simple video analysis in the teaching and assessment of gymnastics.

There were marked differences in the cartwheel techniques between the highly trained gymnasts and the novices, as noted in most measured angles (see Table 2). This supports that the proposed method is effective in differentiating gymnastic techniques performed by individuals at varied skill levels. It is interesting to note that no differences in the hip angles were found between the two groups, suggesting that perhaps the hip is the easiest joint for novices to extend when performing a cartwheel. Teachers and coaches may consider drills that emphasize correction of movement errors in other joints when teaching beginning learners.

Monitoring learning progression of a skill is important for PE teaching and coaching. Using the proposed video analysis method, we noted improvements in the ankle and knee after one session of intervention (see Table 3). With 20 minutes of practicing cartwheel-related drills, participants performed a cartwheel with more pointed toes and straighter knees. It should be noted that the control group also displayed more extended knee angles at the post-test. This was somewhat unexpected and may be related to the choice of drills in the control group. For example, practicing the handstand facing the wall may have promoted a straighter knee when performing a cartwheel later on. We also allowed a free choice of a balance element during the mini-routine and participants may have selected a skill that emphasizes a straight leg posture (e.g. Arabesque, Y-balance). No change in the hip, shoulder, and torso angles for both experimental and control groups were found. As noted earlier in Study 1, there was no difference in hip angles even between highly trained and novice gymnasts. Thus, one would not expect further improvements in the hip angles for the novices after the cartwheel intervention. For the shoulder and torso angles, the entire body needs to approach an inverted position for good performance. Given the difficulty of achieving an inverted orientation, the 20-minute duration of the intervention might have been insufficient for the novices to make noticeable improvement in the shoulder and torso angles. Future studies could follow the learning process for a longer duration, preferably over multiple intervention sessions, to confirm the typical time required for novices to master the skill. From a methodological perspective, there is some potential to use the proposed video analysis to monitor the learning progression of dynamic, asymmetrical and multi-planar gymnastics skills.

There are a few limitations to this study. First, the proposed analysis method only assesses the cartwheel performances of the participants from the side view in two video frames. We acknowledge that the restricted viewing position has limited the representativeness of an information sample (Plessner, Haar, 2006) and therefore does not provide a holistic assessment of the entire cartwheel movement in the same way that a judge, coach or teacher may evaluate the skill. The current method does not include other criteria that are considered important for good performances, for example, placement of hands and feet in a straight line (Smith et al., 2003). Second, only one trial was recorded per participant to resemble the time allowed in a typical PE lesson. Given the large variance in performance for beginning learners, we acknowledge that the recorded trial may not be representative of the learning progress. Future studies can examine the number of trials required for performance to be stabilized. Such knowledge may further enhance the reliability of the proposed method. Third, we showed that the method could differentiate between highly trained gymnasts and novices but most PE teachers do not work with national athletes. A meaningful extension to this study will be to examine if the proposed method can differentiate among a larger sample of novices, especially school children. Finally, the feasibility and effectiveness of applying the proposed method in peer assessment for enhancing learning warrant further investigation.

5. Conclusion

This study proposed a simple video analysis method to analyze the cartwheel, a dynamic, asymmetrical and multi-plane skill. With excellent intra- and inter-rater reliability, this method can successfully differentiate gymnasts of varied skill levels and demonstrate potential to track the learning progressions of novices. This 2D video analysis method requires only affordable equipment and simple procedures, making it a practical way for coaches, teachers and students to evaluate gymnastics movements objectively. The good agreement among the raters with different gymnastic abilities suggests that the proposed method can be readily adopted by coaches, teachers and students regardless of their personal experience.

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Published in the Russian Federation
European Journal of Physical Education and Sport
Has been issued since 2013.
ISSN: 2310-0133
E-ISSN: 2310-3434
Vol. 12, Is. 2, pp. 58-62, 2016

DOI: 10.13187/ejpe.2016.12.58
www.ejournal7.com

UDC 37

Differences in Physiological Responses of Synchronized Swimming Athletes and Female Swimmers

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Abstract

Synchronized and classical swimming are two different sports taking place in the special environment of water. They have main differences but also essential similarities. The purpose of this study was to examine the characteristics of physiological responses of swimmers and synchronized swimming athletes. The sample consisted of 24 national-level female athletes (n = 12 synchronized swimming athletes, aged 16 ± 1.0 years and n = 12 athletes of swimming, age 16 ± 1.0 years). All participants performed 6 attempts of 50 meters with 1min mixed time for each 50m (6x50m freestyle swimming, 25m with maximum intensity without breathing and 25m active recovery). Anova analysis showed that physiological responses of swimmers and synchronized swimming athletes for this sample are not statistically significantly different. Difference was observed in performance time, with female swimmers having significantly lower values of performance time (107.7 ± 9.3sec and 92.5 ± 4.07sec for the synchronized swimming and classical swimming respectively, Sig .000). Further research among the athletes of these sports is needed for the conduction of significant results. Different protocols and different swimming distances could be used in next studies in order to better develop training procedure of both sports.

Keywords: synchronized and classical swimming, lactate, heart rate.

Characteristics of Physiological Responses of Synchronized Swimming Athletes and Female Swimmers

1. Introduction

Synchronized swimming is a demanding sport which requires advanced water skills, great strength, aerobic endurance, flexibility as well as exceptional breath control. The athletes, in solos, duets, trios, combos, or teams, must perform a synchronized routine of specific moves in the water, accompanied by music.

On the other hand, classical swimming is a technical sport in which athletes must face time and velocity in several swimming distances. Even though the nature of the two sports is different, the athletes of both sports have to deal with the special conditions of aquatic environment. This means that part of the training procedure is similar and that coaches of the two sports can learn from each other.

In both sports, repeated bouts of freestyle swimming with maximum intensity without

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breathing are part of the training procedure in order to develop speed and better breath control. For synchronized swimming athletes, breath control is essential when performing the demanding routines in upside down position. Swimmers must have exceptional breath control in order to keep a better steady horizontal position in all out bouts, after the starts and turns. Physiological responses of the athletes of the two different sports in this common training part are of great interest.

25m freestyle swimming with maximum intensity without breathing is a type of dynamic apnea. Low intensity swimming after repeated bouts of maximum intensity causes less concentration of blood lactate (Cazorla, Dufort, Cervetti, 1983).

1. Blood lactate concentrations are between 1 - 2 mmol / l at rest and can increase up to 10 - 20 mmol / l at maximum intensity efforts (Maglischo, 2003). The extent of accumulation depends on the intensity of swimming speed, the range of oxygen consumption and the type of muscle fiber (Maglischo, 2003). In previous studies (Ferretti, Costa, Rerrigno, Grassi, Marconi, Lundgren, Cerretelli, 1991; Joulia, Steinberg, Wolff, Gavarry, Jammes, 2002; Joulia, Guillaume, Faucher, Jamin, Ulmer, Kipson, Jammes, 2003; Andersson, Liner, Fredsted, Schagatay, 2004) during apnea an increase in blood lactate concentration has been observed.

A study in synchronized swimming showed that during synchronized swimming figures of apnea lasting 50 sec, the levels of lactate ranged up to 1,5 mmol / l, while heart rate went down up to 70 beats / min. In repeated efforts of apneas in freestyle swimming with moderate intensity of 3min, lactate levels ranged up to 4,3 mmol / l, while heart rate increased during periods of apnea up to 132 beats / min (Figura, Cama, Guidetti, 1993). In another study, levels of lactate in synchronized swimming athletes after a maximal 400m freestyle swimming test were higher than lactate after a 3min synchronized swimming routine (Bante, Bogdanis, Chairopoulou, Maridaki, 2007). A research of Yamamura et al. (1999) showed that lactate of synchronized swimming athletes after maximal effort of 100m freestyle swimming reached 8,5 mmol / l.

In swimming, in a research that was carried out during the European Championship, levels of lactate for women athletes of medium distances, ranged at 10 ± 1,5 mmol / l (Bonifazi, Martelli, Marugo, Sardella, Carli, 1993). In another investigation of Avlonitou (1996), female swimmers showed lactate of 12 ± 1 mmol / l in medium distances after national championship.

The purpose of this study was to examine the characteristics of physiological responses of synchronized swimming athletes and female swimmers, after a swimming test of 6x50 m freestyle swimming (25m with maximum intensity without breathing and 25m active recovery with one breath every three strokes).

2. Methods

Sample

The sample consisted of 24 athletes. Of these, n = 12 were synchronized swimming athletes aged 16 ± 1years, with body height 167 ± 5 cm and weight 57 ± 6 kg and n = 12 female swimmers aged 16 ± 1 years, body height 165 ± 5 cm and weight 56 ± 8 kg and competitive experience at least 2 years. The protocol of this measurement has the approval of the ethics committee.

Procedures

All athletes, after being informed for the purpose of the research, the potential risks and the measurement procedures, they gave with their parents their written consent. Afterwards, we proceeded with conduction of the measurement. All participants were taking part in a daily training program lasting two hours a day, at least five times a week. Body height and body weight were measured in the afternoon between 15:00 to 17:00 prior to workout in their fitness club (Ilisiakos and N.O.Volou). Firstly, two days before measurements, in a separate session, they swam 25 meters freestyle swimming with maximum intensity in a 50 m pool, in order to calculate the 50% of best performance for each swimmer. The aim of this work was to verify that the speed during the active recovery would be at the level of 50 %.

The protocol of this study is for the development of the ability of breathe holding during swimming (Maglischo, 2003).

In the first session, all participants started with a warm up of 1000 m under the guidance of their coach. After a rest period of 15 minutes, they swam 6x50m freestyle swimming with 1 min mixed time for each 50m (25 meters maximum intensity without breathing and then another 25 meters using freestyle swimming with an intensity of 50 % of the maximum performance of

25 meters with one breathe every three strokes). Also, sings were put in the bottom of the pool so as for the athletes to know when to stop the maximum effort.

Furthermore, during active recovery, hand signals were used from one of the examiners to communicate with the participants beckoning them to maintain an appropriate pace (West, Drummond, Vanness, 2005). The athletes were familiar with the speed of active recovery during training and it was not difficult to follow this pace. The ability of swimming in maximum intensity without breath is essential for both athletes of synchronized and classical swimming, for the first because of the routines in an upside down position with breath control, and for the second, for maximum efforts, in order to reduce the bilateral movements of breathing and to keep the steady, horizontal position.

For the purpose of this study, the following variables were measured. Performance time of 6x50m freestyle swimming was recorded with electronic timer Seiko Water Resistant 10bar S140. In order to determine the maximum concentration of lactate in blood, immediately after the end of the sixth attempt, in a sitting position, capillary blood samples were taken from the fingertip of the participants at 3^{rd} , 5^{th} , 7^{th} min and analyzed by the automatic analyzer Scout Lactate Germany . Also, heart rate was measured manually from the wrist immediately after the swimming of 6x50m in 10 seconds. Heart rate is referred to as beats per minute.

Finally, two indices were calculated from the previous variables: lactate / average speed and heart rate / lactate. The index of lactate production to average speed indicates the average lactate that swimmers would have for a steady swimming speed. The index of the heart rate to the maximum production of lactate represents the relation between the physiological parameter of heart rate and the metabolic parameter of lactate and indicates how many pulses swimmers would have in average for the concentration of 1 mmol/l.

The water temperature was $26^{o} \pm 1^{o}$ C. All measurements were made 10 to 15 days before the main competition of the summer season, in an open swimming pool of 50m and always by the same examiners. They all started swimming from the water taking into account the regulations of swimming.

Statistical analysis

Measurement results are expressed as mean values with their standard deviations (M ± SD). For the statistical analysis of data, the analysis of variance ANOVA was used. The level of statistical significance was set at $p < 0.05$. The analysis of data was performed with the statistical program SPSS 20.0.

3. Results

The results showed that physiological responses of female swimmers and synchronized swimming athletes for this sample did not differ significantly. Difference was observed in performance time, with female swimmers having significantly lower values of performance time (107.7 ± 9.3sec and 92.5 ± 4.07sec for the synchronized swimming and classical swimming respectively, Sig .000), (Table 1).

The values of the total sample in lactate and heart rate show that they have the same physiological responses after freestyle swimming of maximum intensity, while the differences observed in time performance suggest that female swimmers do a targeted training that aims to the reduction of time performance.

For the two indices, values do not differ between the sample of synchronized swimming athletes and female swimmers, meaning that physiological responses of the athletes of these two sports are manifested in a same way after this maximal effort.

Table 1. Means, standard deviation and statistical significant differences between the two sports

	Lactate (mmol/l)	**Heart rate (beats/min)**	**Total performance time (sec)**	**Lactate / mean velocity (mmol/l)**	**Heart rate / Lactate (beats/min)**
Synchronized swimming	6.9±2.6	171.6±9.8	107.7±9.3	4.9±1.7	27.1±11.1
Swimming	6.4±2.1	175.0±12.1	92.5±4.07	3.9±1.2	29.1±8.3
Sig.	N.S.	N.S.	.000	N.S.	N.S.

4. Discussion

In the present study differences in physiological responses were examined between synchronized swimming athletes and female swimmers, after 6x50 m freestyle swimming (25m with maximum intensity without breathing and 25m active recovery with one breath every three strokes).

There is no similar research in literature comparing athletes of synchronized and classical swimming, so the following articles refer to findings concerning physiological responses of each sport separately.

Comparing the results with previous study, the lactate after 400m with maximum intensity in synchronized swimming athletes aged 13.8 ± 0.2 years (Bante, Bogdanis, Chairopoulou, Maridaki, 2007), was at the same level with the present investigation.

In another study of Figura et al. (1993), after 3΄ of freestyle swimming in moderate intensity and repeated apneas, lactate levels ranged up to 4.3 mmol / l, while the heart rate increased during periods of apnea up to 132 beats / min (Figura, Cama, Guidetti, 1993), unlike the present research that lactate arrived at higher levels probably because of the higher intensity and the heart rate reached 173 beats on average for the whole sample.

Yamamura et al. (1999) in their research found higher lactate values in synchronized swimming athletes after maximum intensity test of 100m freestyle swimming compared with the values found in this study (8.5 ± 1.6 and 6.9 ± 2.5 mmol / l, respectively).

In a research involving swimmers (Avlonitou, 1996), the values of lactate were higher at medium distances with respect to those of the present study (12 ± 1 and 6.9 ± 2.5 mmol/l respectively). Also, in a research conducted during the European Championship, the levels of lactate for women athletes in medium distances averaged 10 ± 1,5 mmol/l (Bonifazi, Martelli, Marugo, Sardella, Carli, 1993). One possible explanation for the lower lactate values in swimmers of this research may be that among 25m freestyle of maximum intensity the athletes also performed 25m freestyle swimming for active recovery with one breath every 3 strokes. The active recovery perhaps kept lactate at lower levels than the lactate observed in other swimmers of the same age.

5. Conclusion

In conclusion, the results of this study indicate that physiological responses of synchronized swimming athletes and female swimmers in this sample after the test that was applied, was not statistically significantly different. The statistically significant difference in the time performance of swimming athletes was probably due to the fact that their training is focused on reducing performance time. Athletes of synchronized swimming on the other hand, are focused in demanding upright figures than in swimming speed. On a general level, the repeated efforts of 25m maximum intensity with 25m active recovery between sets may have kept lactate at a lower level in the whole sample.

This research leads us to the fact that coaches of both sports can use or follow parts of the training procedure of the other sport that can help the completion of training programming for the improvement of abilities that are important for optimal performance. Consequently, further research among synchronized swimming athletes and female swimmers must be done, in different distances, with different stops and in different age groups in order to give us more information about the physiological responses of athletes of these sports and so to be able to make safer conclusions in this field.

Training of aquatic sports has differences and similarities. The investigation and evaluation of physiological responses of swimmers and synchronized swimming athletes could give helpful information to coaches and athletes to improve programming training procedure and aiming to better performance.

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Published in the Russian Federation
European Journal of Physical Education and Sport
Has been issued since 2013.
ISSN: 2310-0133
E-ISSN: 2310-3434
Vol. 12, Is. 2, pp. 63-68, 2016

DOI: 10.13187/ejpe.2016.12.63
www.ejournal7.com

UDC 004

Which Visual Optimal Approach Evaluate the Accuracy Kicking Success in Soccer

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Abstract

Seen the Soccer Accuracy kicking is formulated based on the esteem of the player. Our interest in this study came from the reality of the means of assessment available to Algerian coaches. Where the Limitations of existing methods for evaluation of kicking success in soccer, do not allow them to judge the progress of them players. The objectives of this study are to determine the impact of vessel information on Accuracy kicking success among 20 soccer players under18 years, representing the team Sidi bel abbes for year 2014-2015 in Algerian championship according to them results in the proposed situations case the Eye dominance and Binocular vision in accuracy test.

Based on statistical analysis applied, we confirm:

- There is a strong positive correlation relationship between the proposed visual situations (Eye dominance- Binocular).
- The weakness of the research sample in binocular vison situation return to the ability of brain to judge the received images from the both eyes.
- Developing estimations accuracy kicking success required that the dominant eye must provide the most of the visual input to the brain.

Where the most important factors influence the Accuracy kicking success among our soccer in the frequent situation consisted in the conflict between dominant eye and weak.

Keywords: soccer, evaluate accuracy, kicking success.

1. Introduction

Successful goals typically come from shots that have both pace and accuracy where literature review confirmed that Soccer performance in shooting depends upon a myriad of factors, such as technical/biomechanical, tactical, mental and physiological areas. In our case, we refer to American sport education program that, the most important components of shooting are balanced stance, focusing on the target (McGee, 2007). Whereas said that, (Andersen, Dorge, 2009) players generally self-select the optimal approach speed for both shot velocity and accuracy. While the (America, National Soccer Coaches Association of, 2004) that the key for the player will be to identify certain visual cues that point toward the right decision. In general, shooting with Power and accuracy are two major components of any shot (Dorothy, Lois, Frank, 2003). Whilst (Rechard, 1990) indicate before choosing the way the player must controlling the ball into a

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position to shoot, where he should observe the position of the goalkeeper and select the appropriate shooting skill. Based on the Accuracy, which is paramount whether the player opts for power in the shot using the instep drive from that (Clayne, Garth, 1979) the shooting Skills are logically divided into (1) accuracy skills, (2) power skills, and (3) maneuverability skills. However, (John, Vincent, 2001) the most goals are scored by shooting hard and accurately on goal. In addition, combining power with accuracy needs a good technique that (Stewart, 1995) explains in the right combination of Balance, control, accuracy and power. In our modest study, we chose the Impact of Visual information evaluate the Accuracy. Where (Robertson, Elliott, 1996a) and (Davids, Renshaw, Glazier, 2005) confirmed the important role in the control and production (Robert, Koger, 2015) of shooting movement to estimate the outcome as the power and accuracy required in difficult situations of games. From that, our background is based on the confirmation of National Alliance for Youth Sport (National Alliance for Youth Sports, 2011) that players must work on their accuracy, distance, and technique based on visual training. where our background medical confirms that the weakness or absence of the ocular dominance is significant when the weak eye is the dominant eye. For this propose, our research sample was consisted by Players confirmed category under 18 years, representing the team Sidi bel abbes for year 2014-2015 in Algerian championship, tested in two situations (Eye dominance - Binocular).

Where the Purpose of the current study was to anticipate their strategist under the two deference visual plans (Debra laParth, USA) as delineate of the roles visual information where the literature reviews in in sports confirmed:

- The action representations of experts are stated to be hierarchically organized containing cognitive motor units, which act to guide the planning and execution of actions (Schack, Mechsner, 2006).
- The action representations of the novices have been shown to be less hierarchically organized (Schack, Hackfort, 2007).

While the medical confirms that the weakness of the ocular dominance is significant when the weak eye is the dominant eye (Fischer, 2010).

2. Methodology

Subjects

Our research sample was consisted by 20 soccer Players confirmed category under 18 years, representing the team Sidi bel abbes for year 2014-2015 in Algerian championship, them homogeneity were calculate based on ophthalmological examination vision 10/10 in each eye, total mastery of shoots with a success rate, over than 70% in the practical test normal vision, furthermore weight, age and all they were informed about procedures and all provide written consent. Whereas to expert the study protocol and methods we choose the laboratory OPAPS "Institute of Physical Education of our University" who approve it by the professors of football and neuropsychologist,

Testing Protocol

Our sample was tested in two situations plan accuracy test based on the test shooting accuracy figure 1:

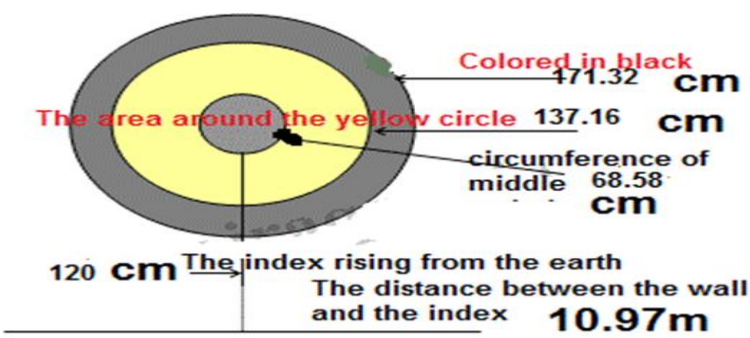

Figure 1. Measure accuracy in the case of our study

This procedure describes the method used to measure the Accuracy shooting skill.

Procedure: The soccer stands 10.97M from the distance between the walls where the index rising in horizontal plan 1,20m from Surface earth, and for the index circle seen fig1. The player did 3 shot counted. Whereas in the Eye dominance we have crowded the weak eye.

Scoring: middle circle 3 points, yellow circle 2 points for black circle 1 point other 0 point.

Statistical Analyses

Data analysis was performed using SPSS 22.0 for Windows (32BIT). Data obtained from the tests showed a normal distribution and were presented as mean ± standard deviation. Paired sample t-test was conducted to combine the results obtained from the two cased plan where the relationship between the two proposed situation was analyzed by Pearson correlations (r).

3. Results

The characteristics of the study sample are presented in Table 1. Where all comparisons with the Shapiro-Francia test shows the normality using and Levene Statistic shows the homogeneity.

Table 1. show the Characteristics of the sample in the variables chosen to study

Variable	means ± SD	Shapiro-Francia test	Levene Statistic	Sig.
Age (years)	17,20± 0,77	0,99	0,20	0,66
Weight (kg)	68,16 ± 5,27	0,94	1,45	0,24
Height (cm)	174,75± 4,58	0,97	0,02	0,89
Age Training	5,55±0,51	0,97	0,34	0,97
Eye dominance	20,75±5,67	0,99	1,41	0,25
Binocular	18,25±2,09	0,98	0,06	0,81

For the Table 2 which show the regression analyses relating the situation Binocular and Eye Dominance, all the relationships calculate between the proposed situations are strong positive significant at p value ≤ 0.05 between the two situations. while the program choose sin the Model 1 that Eye dominance was able to explain the changes in the Binocular, where F and T are significant at P <0.001 form that our equation:

Binocular situation = 1,64 + 0,80 Eye dominance

Table 2. show regression analyses relating Binocular and Eye Dominance

Model Enter	R	R^2	Adjusted R^2	Coefficients[a]	T	P	f	P
1	0,98[a]	0,82	0,81	(Constant)	0,90	0,37	84,48	0,00
				Eye dominance	9,19	,00		
Dependent Variable: Binocular / Predictors: (Constant), Eye dominance								

Through the table where we have calculated the Paired Samples Test all the compare are in the benefit of the situation Eye Dominance

The Table 2 show Paired Samples Test calculate between Binocular and Eye Dominance

Age Training	means ± SD	T	Sig.
Eye dominance & Binocular	20,75±5,67	11,18	0,00
	18,25±2,09		

4. Discussion

Through the results table 1, 2 and 3 Based on statistical analysis applied, we confirm:

• There is a strong positive correlation relationship between the proposed situations (Eye dominance- Binocular).

• The weakness of the research sample in binocular vison satiation comparing with eye dominate return to the ability of brain to judge the received images from the both eyes.

• Developing estimations accuracy kicking success required from the dominant eye to provides most of the visual input to the brain. Or the ability of the two eyes to work together to fixes a target and the movement (Turner, Rack, 2006)

From the proof Where agree (Roselius, 2008) that an accurate shot is usually more on target, developed (Asada, Kitano, 2003) as experiments training performed in workouts. Based on the Paired Samples Test and the Regression analyses relating the Binocular with Eye Dominance we certified that the different are related to visual information due to the Eye dominance which must the most of the visual input to the brain (Mann, Grossman, 2010) in the frequent situation (Zerf, 2015). where our results are consistent with (Mishra, Mishra, 2013), (Itay Basevitch, Gershon Tenenbaum, Paul Ward, 2015) that the role of visual information and action representations required from the soccer players to performed their skills, under three visual conditions: normal, occluded, and distorted vision (Zerf Mohammed, Bengoua Ali, 2015). Where (Caljouw, Savelsbergh, 2004) confirms that, the visual-perceptual input has been shown to be an important source of information to regulate action (Zerf, Ali, 2015). However, (Basevitch, 2009) confirms that more detailed examination by the role of visual information help the player to product superior performance, which is essential power and accuracy in our case when the dominant eye provides most of the visual input to the brain. Moreover, (Scurr, Hall, 2009) confirm that the kick accuracy has not been fully described. From that, we agreed the opinion of (Lees, Burwitz, 2000) that kicking is enhanced with training and is a well-developed skill in experienced players (Zerf, 2015).

5. Conclusion

Results from the present study conclude that shooting training accuracy must be applied in non-typical conditions (Zerf, 2015), (Harrison, 2005). Where (Dooley, Titz, 2012) confirm that, the Good conditioning and technique combined with mental toughness are good basic prerequisites for successful goal scoring. From the proof, we support the theory that success back from a Normal vision" is the presence of 20/20 visual acuity in both eyes and the ability to use the eyes together in the binocular vision (Lens, Nemeth, Ledford, 2008). However, our cases Protocol confirm:

1. Any less or conflict in visual information defect motor system to compose and adjust the outcome (Mann, Ho, De Souza, Watson, Taylor, 2007).
2. The Success of our sample in the situation dominant hand and dominant eye resulted in the highest degree of coordination (Kane, 2015) for perception-to-action (Denis, Engelkamp, Richardson, 2012).
3. The weakness of our sample binocular conditions return to the ability to use both eyes simultaneously to focus on the same object and to fuse the two images into a single image (Stein, Stein, 2012) Or the ability of the two eyes to work together to fixes a target and the movement (Turner, Rack, 2006).

Where our find confirmed the vision of (Davids K., Lees A., Burwitz L, 2000) that further interdisciplinary work is needed to enhance understanding of coordination and control of soccer skills in our case.

The important skills to master the outcome shooting skill are intercepting the actions (input) to anticipate (output) (Knudson, 2013) in a low-pressure practice type environment (Bennett, Davids, Savelsbergh, 2004).

Through the above, we recommended our player and couch to the Accuracy kicking success in soccer they must performed their skills, under three visual conditions: normal, occluded, and distorted vision Because the Movement accuracy and coordination problems may be the result of sensory-related problems (Magill, 2010).

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