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No.	Title	Page
01	The Extent of using Principles of Teaching & Effective Management by Physical Education Teachers from the Perspective of Physical Education Supervisors in Koya District, Kurdistan Region	01-09
02	The Effect of using Blended Learning in Situation-Embarrassment and Hand Stand Skill in Parallel Bar for Men	10-17
03	Assessment of Standard, Self-Adapted Mouthguards in Terms of Comfort and Use in Handball, Basketball, and Field Hockey	18-30

The Extent of using Principles of Teaching & Effective Management by Physical Education Teachers from the Perspective of Physical Education Supervisors in Koya District, Kurdistan Region

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ABSTRACT

This part includes introduction of the study. It included an introduction and significance of the study as it talks about the evolution witnessed by the extent of practice by physical education teachers to principles of effective teaching. It is also significant for supervisors. As for problem of the study, it lies in that there is a weakness in practice by physical education teachers of principles of teaching performance in Koya district, Kurdistan Region. The objective of the study was (to identify the extent of physical education teachers' use of effective principles of teaching and management from the perspective of Physical Education supervisors in Koya district, Kurdistan Region), while scopes of the study are: (the human aspect: Supervisors of Physical Education in Koya district, the spatial aspect: Directorate of Education in Koya district, Kurdistan Region and temporal aspect: From 11/01/2015 until 30/04/2016. The used methodology and field procedures, the researcher used the descriptive approach as it is convenient to nature of the problem under study. Part four includes displaying results, analysis and discussion as well as results and statistical treatments, their analyzed and classification in a group of diagrams. Part five is about conclusions and recommendations: (most of the paragraphs in the field of planning achieved weighing means that exceed the threshold of answers, weighing means showed some drawbacks being less than the threshold of answers, the degree of practicing effective teaching principles by physical education teachers relating to application showed that they were practiced largely in general, the degree of practicing effective teaching principles by physical education teachers relating to class management showed that they were being practiced largely, most paragraphs in the field of education received high scores and this showed that the teacher exercised his profession well and there is a clear development in the practice of teachers). From findings of the study, it is noticed that the degree of practicing effective teaching principles by physical education teachers relating to evaluation showed that they were being practiced largely.

Keywords: Perspective, physical education, Koya, Kurdistan Region

INTRODUCTION

The art of teaching became no longer based only on instinct, talent and practice as it was in the past, but

it is added to learn principles of the job and rules of the art. Teaching has become a science that has its principle, rules, philosophy and trends which are based on theories of education, psychology, educational and vocational guidance.

In addition, the teaching job is one of the noblest professions performed by humans due to the clear impact of the teacher on the whole society, not only on its members as is the case with other professions, such as doctors, engineers, lawyers and artisans. When a teacher works in the classroom, he does not teach a

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single student, but he teaches dozens, but hundreds of students during the same day. The teacher has a major impact on the minds of his students, their personalities, the way they grow and open it to the facts of life. Adaptation to new developments requires comprehensive development that takes into account all aspects of growth in an integrated and balanced way. Since the world has become more complex as a result of challenges posed by technology in all aspects of life, success in meeting these challenges does not depend on the quantum of knowledge, but rather on how to use the knowledge, its application and generation and solve problems efficiently and quickly. "so the teacher should have a broad and deep background in his field, as well as being able to collect good knowledge in other fields of life, so that students through their interaction with him manage to realize the interconnection between various scientific domains" (Zakia 2007: 11).

Moreover, the teaching process is one of the oldest activities presented by man in the social and educational upbringing process, if a set of methods of teaching formed for humans. Although such methods are old, they cannot be regarded as ineffective, as teaching is a renewable process based on experience of the teacher, his experiments, preparing, qualification and creativity. Any teaching method can be effective in a certain situation, and ineffective in other educational situations, but what can be said is that there are modern methods that have been developed in last decades of the twentieth century, to be accessible by the teacher to choose what is appropriate to the educational situation (Brown, G. and Atkins, M. 1988).

School management, public and private methods, empirical training on teaching, transforming theories and scientific foundations into to educational skills show their impact on the teacher's performance and his technical work (Muhammad Belal et al., 2007: 7).

Beshir Al Tartouri (2006) refers that a good teacher helps regulate learning expertise and participation in educational innovation processes as he is required to implement, follow-up, and identify deficiencies of learners. He is their role model and example and he guides a lot of them who are influenced by his personality and imitate it. (Tartouri, 2006).

Physical education teacher is the basic pillar of the educational process at school as many educational opportunities, which do not come for many other

teachers of various subjects, are available to him. Jaber (1998) also refers that effective teaching is the kind of teaching that raises the level of students to the fullest extent of their capabilities. Effective teaching is also known as the kind of teaching that leads to change in pupils in different areas of growth. (Jaber, 1998).

A teacher should start from the rule saying that students involved in active learning articulate meanings of their own and build their self-knowledge through learning. Here it is necessary to emphasize the role of effective education, including its educational activities for the learner, which allow students to engage effectively in situations that take into account their self-interpretations, forming questions and finding solutions to the problem. This gives the students the opportunity to design self- activities with the support and encouragement from the teacher and so they encourage the way of problem solving, (Rubayah, 2004, p. 1).

The teacher is considered a leader and guide for students to achieve their educational goals as he helps them learn and collaborate with others in order to get the knowledge and positive skills. A teacher encourages students through appropriate activities in order to use their abilities of discovery, conclusion and application. (Rashidi, 2005, p. 2).

There are several factors that influence the teacher's practice of principles of effective teaching in a classroom situations and these factors lie in the teacher's personality, his experience and philosophy from which he can move in his work, general values and the content of lesson material, whilst (DELSO 1994) found that a teacher who owns innate and environmental qualities is influenced in his practice of effective teaching. (Manawer, 2001, p. 338). Besides, effective teaching depends on self-activity and positive participation of the learner through which he can search using a variety of scientific activities and processes that help him to reach the required information by himself under the supervision and evaluation of teacher. (Al Ali, 2006, p. 1). In addition, Al Shibli (2000) refers that among effective teaching elements is good treatment, selection of the appropriate educational method, taking into account individual differences, flexibility in learning, connecting the subject to students' lives and their participation in the lesson material and planning a good lesson. (Al Shibli, 2000, p. 84).

Al Rashedy (2004) says that effective teaching depends on two main aspects:

1. The learning skill and its ability in mental and intellectual instigation of students.
2. Positive relationship between the teacher and students and patterns of relations that motivate them to exert their utmost effort in learning (Al Rashedy, 2004, p.1).

The role of the educational supervisor is important to follow up and provide guidance for teachers in order to implement the course of Physical Education effectively. An educational supervisor is an experienced person in scientific and educational fields. He visits teachers, watches their teaching, sports skills offered to students in order to diagnose points of strengths and weaknesses, suggests and facilitates what would develop the work of the teaches. A teacher has to listen to what the supervisor is saying without stiffening or sensitivity, but out of a desire to develop the work and make better achievement. (Al Naddaf., 2003: 287).

The current study tries to find out the degree of practicing principles of effective teaching by physical education teachers through supervisors of physical education, who are the link between the educational policy and decision-makers on one hand, and the field specifically in specific places of physical education on the other. through previous illustration, it became clear that the problem of the study is shown in the inability to achieve these hopes in the field of physical education teaching unless in presence of an aware and well-prepared teacher in line with modern developments that marked the concepts of physical education to occupy a lot of space in the field of Physical Education.

By the fact that both researchers work in the field of teaching and supervision in physical education in educational levels and work in the field of teacher preparation through teaching at the Faculty of Physical Education, they noted some decrease in teachers' perceptions of concepts of effective teaching in the field of Physical Education, which makes this phenomenon worthy of research and highlights the essence of the problem in the following the main question:

To what extent teachers of physical education use principles of effective teaching from the perspective of supervisors of Physical Education?

PROCEDURES OF THE STUDY

The researchers used the descriptive method as it is appropriate to the nature and problem of the study.

Population & Sample of the Study

The population of the study included male and female physical education supervisors in the Directorate of Education, Koya District and the sample was selected purposively consisting of (5) male and female physical education supervisors in Koya District.

Tool of the Study

The researchers used the questionnaire as a tool to complete the study's requirements as they used previous and similar literature in educational practices. The questionnaire form included (44) paragraphs distributed on (5) main fields as follows:

1. Planning.
2. Application.
3. Class Management.
4. Educational Activities.
5. Evaluation.

After presenting the questionnaire on (3) arbitrators who are specialists in curricula and teaching methods, some modifications were made as directed by them and applied on members of the study sample.

Performance validity

Validity was achieved through questionnaire presentation after depending on a group of arbitrators of professors of curricula and teaching methods to judge the tool and its applicability through connecting each phrase to its main elements. The arbitrators expressed some remarks upon which some modifications can be made to be ready to test their validity, Annex (1).

Reliability

Questionnaire form reliability was determined through retesting as it was applied on a random sample outside the original sample of the study. After a week, retesting was made on the same sample and using Pearson's correlation coefficient and then extracting reliability coefficient (86%) which is a high reliability percentage.

Exploratory Trial

In order to determine negative sides accompanying the study, the researcher made the exploratory trial on (3)

male and female supervisors outside the sample of the study on: 10/01/2016.

Main Trial

After completing procedures of the study, the researcher performed the main trial on the sample on 01/02/2016.

Statistical Methods

1. Arithmetic mean.
2. Standard Deviation SD.
3. Percentage.
4. Simple Correlation.

PRESENTING & DISCUSSING RESULTS

Presenting & Discussing Results of Planning

This Table 1 above shows that arithmetic means for paragraphs of this field range between 2.4 and 4.4 as paragraph No. (6): "Explaining goals and their achievability within the school's possibilities" came at first place (mean: 4.4), paragraph No. (8): "Preparing a daily plan with various goals" came at second rank (mean: 4.00), while paragraph No. (3): "Good preparation of the subject" came at third place with mean of 3.8.

In addition, paragraphs 3 and 6: "Good preparation of the subject" and "Explaining goals and their achievability within the school's possibilities" at fourth rank (mean: 3.6), paragraph No. (5): "Facing changed & contingent situations (climate changes, program change and activity days) successfully" came at third rank with mean 3.4, while paragraphs (1) and (2): "Preparing a comprehensive & clear annual plan" and "Reviewing the Teacher's Guide at planning" came at sixth place with mean 2.4.

Most paragraphs achieved weighing arithmetic means that exceed the threshold of the answers, while they

also showed us some drawbacks due to the decline less than the threshold with regard to paragraph (1) "Preparing a comprehensive & clear annual plan" with the lack of such long-term planning by the teacher which reflects something of the simulation in the presence of this profession. Since that planning means the arrangements placed at present in order to make a major change with strong impact in the future, they are based on mobilization of all forces, efforts and resources, continuing to work persistently based on generalization which sets long-term goals in mind at all its sides and every movement, getting ready and empowered (Shamel, 229: 11990), so planning should include a short-term and other long-term strategies. The researcher believes that planning that includes developing strategies at the core of the work of the teacher, where results of planning plans represent "the best way to achieve a certain goal, include decisions relating to the achievement of the goal, ways of implementation and its stages" (Shamel, 86: 11990).

As for paragraph (2) "Reviewing the Teacher's Guide at planning" which got means not exceeding the threshold, it shows that the degree of practice is low, and the researcher attributes the reason either due to neglect of the teacher in using the Teacher's Guide or the failure of the government and Ministry of Education not to provide books and means of education. This is because among the things that need larger consideration by those responsible for education is restriction in interest on the school book, ensuring its printing and distribution on students at the beginning of the studying year with complete neglect of the teacher's book. It rarely reaches teachers and if so, they receive it at the end of the studying year. Since it is logical that a teacher plans lessons before application the process of planning and training should precede lesson application. Thus, the Teacher's

Table 1: Arithmetic means and degree of practice for each paragraph of planning

Serial	Terminology	Rank	Mean	Practice degree
1.	Preparing a comprehensive & clear annual plan	6	2.4	Few
2.	Reviewing the Teacher's Guide at planning	6	2.4	Few
3.	Good preparation of the subject	4	3.6	Great
4.	Preparing learning environment properly and applicably	3	3.8	Great
5.	Facing changed & contingent situations (climate changes, program change and activity days) successfully	5	3.4	Great
6.	Explaining goals and their achievability within the school's possibilities	1	4.4	Great
7.	Forming behavioral goals in a procedural way	4	3.6	Great
8.	Preparing a daily plan with various goals	2	4	Great

Guide can barely be benefited from by teachers if they receive it.

Hence, an educational director should ensure the arrival of the teacher's guide to all teachers before the start of the school year in order to train teachers on modern trends that may be included in the teacher's guide. In addition, this can enable to discuss with teachers the contents of the teacher's guide before the start of the school year to complete utilizing it in enriching the educational situation, develop the educational process and in order to be reflected spectrum All being in the lessons, which precedes the implementation process and to say that the relationship between the school's book and the teacher's guide is actually a complementary relationship.

Presenting and Discussing Results of Application

Table 2 shows arithmetic means of members of the study sample concerning the second field "application". It can be noted from this table that means of paragraphs in this field ranged between 5.00 and 1.8. Paragraph No. (6): "Always use a correct language" came at first place (mean: 5.00), paragraphs (1) and (4): "Asking questions to ensure students' understanding of sport skills" and "Presenting the subject material (motor skills) for students in a logical and consecutive manner" at second place with means 4.2, paragraph (3): "Considering individual differences among students" at third place with mean 4.00, paragraphs (2) and (5) "Motivating students (happiness and joy) during application" and "Positive interaction with all students" came at fourth place with mean 3.2, while paragraph (8): "Providing

suitable application opportunities for all students" came at fifth place (mean 3.00), paragraph (7): "Integration among branches of physical education" came at sixth place with mean 2.8, paragraph (10): "Increasing the time dedicated to application" came at seventh place (mean: 2.4), paragraph (11) "Integration with other disciplines" came at eighth place (mean: 2.00), whereas paragraph (9): "Variability in methods used in class" came at ninth place (mean: 1.8).

It is noted that the degree of practicing principles of effective teaching by physical education teachers related to application showed that they were practiced to a great extent generally as the mean was 5.00. However, means of each paragraph in this field showed few practices by physical education teachers of three paragraphs: Variability in methods used in class, increasing the time dedicated to application and integration among branches of physical education. Invariability of teaching methods may indicate that teachers still consider physical education aiming to develop the psychomotor domain of students. In this respect, Doherty discussed that teaching methods of physical education are variable by the variability of goals which a teacher seeks to achieve. If a teacher wants to achieve motor goals, the direct method is the most appropriate, while if he wants to develop social relationships between students, he should use another method such as the bilateral method.

In addition, lack of practice by teachers to increase the actual application of mathematical skills in physical education dedicated time is perhaps due to the limited availability of tools and sport spaces besides

Table 2: Arithmetic means and practice degree for each paragraph of application

Serial	Terminology	Rank	Arithmetic mean	Practice degree
1.	Asking questions to ensure students' understanding of sport skills	2	4.2	Great
2.	Motivating students (happiness and joy) during application	4	3.2	Great
3.	Considering individual differences among students	3	4	Great
4.	Presenting the subject material (motor skills) for students in a logical and consecutive manner	2	4.2	Great
5.	Positive interaction with all students	4	3.2	Great
6.	Always use a correct language	1	5	Great
7.	Integration among branches of physical education	6	2.8	Great
8.	Providing suitable application opportunities for all students	5	3	Great
9.	Variability in methods used in class	9	1.8	Few
10.	Increasing the time dedicated to application	7	2.4	Few
11.	Integration with other disciplines	8	2	few

the increase in the number of students per class. As for the lack of physical education teachers' practice the link between physical activity and the rest of other subjects, this may be due to the weakness of knowledge repertoire of teachers that needs to be followed-up by Physical Education supervisors. In this context, (Nichols) pointed out that physical education teachers have opportunities to use motor and sport activities in learning other subjects such as mathematics, language, social studies and other.

This Table 3 shows that arithmetic means of paragraphs of this field ranged between 6.2 and 2.8. Paragraph (3): "Supervision and follow-up the session" came at first place (mean: 4.2), paragraph (2): "Cooperation among students" came at second place (mean: 3.8), paragraph (4): "Providing factors of security & safety that may affect student's safety during performance" came at 3rd place (mean: 3.6), paragraph (6): "Applying rules of order in all parts of the session" came at the 4th place (mean: 4.3), paragraphs (1) and (5): "Good organization of class session" and "Dealing with offensive behaviors wisely" came at 5th place (mean: 3.2), paragraph (7): "Quick distribution of students on application stages" came at 6th place (mean: 2.8), paragraph (8): "Providing devices and tools to facilitate application" came at 8th place (mean: 2.6).

From results of the study, it is noted that the degree of practicing principles of effective teaching and classroom management related to the field physical education teachers was large in general, with the mean for this field amounted to (4.2). However, the arithmetic means for each paragraph of this area showed a large practice by physical education teachers. It talked about classroom management as being particularly important in the learning process as they seek to provide and create all the atmosphere of

psychological and social requirements, which must be provided to the teacher as an educational atmosphere actor, safe environment, raise the achievement of scientific and cognitive level taking into account the integrated growth of the students. Among the most important rules that should be followed by the teacher's within the classroom to achieve effective education for students is commitment of time when the teacher adjusts his schedule in attending classes, prepares the lesson in advance before attending students to move away from classroom problems as adjusting time at the end of the session is least as important as the beginning. Moreover, good preparation is important for the teacher in good preparation and planning of the lesson and ensuring the availability of all the tools, materials and techniques.

Presenting & Discussing Results of Education Activities

This Table 4 shows that arithmetic means of paragraphs of this field ranged between 4.2 and 2.4. Paragraphs (3) and (6): "Participation in external sport activities supervised by the education directorate" and "Organizing internal activities among classes of the same school" came at first place (mean: 2.4), paragraphs (1) and (4): "Variability of activities, individual & group skills" and "Considering connection between activities and educational goals" came at second place (mean: 3.2), paragraphs (2, 8, 9): "Concentration on practical aspects of the lesson", "Considering the connection between the activities with environment and society" and "The interest in training school teams outside school time" came at 3rd place (mean: 3.00), paragraph (5): "Considering selection of activities that respond trends and desires of students" came at the 4th place (mean: 2.6), paragraph (7): "Activating the use of educational

Table 3: Arithmetic means and practice degree for each paragraph of class management

Serial	Terminology	Rank	Arithmetic mean	Practice degree
1.	Good organization of class session	6	3.2	Great
2.	Cooperation among students	3	3.8	Great
3.	Supervision and follow-up the session	1	4.2	Great
4.	Providing factors of security & safety that may affect student's safety during performance	4	3.6	Great
5.	Dealing with offensive behaviors wisely	6	3.2	Great
6.	Applying rules of order in all parts of the session	5	3.4	Great
7.	Quick distribution of students on application stages	7	2.8	Great
8.	Providing devices and tools to facilitate application	1	2.6	Great

method during explanation of sport skills” came at 5th place (mean: 2.4).

It is noted in Table 4 that most paragraphs obtained high degrees which shows that teacher exercise their jobs well, which refers that the teacher practices his job well and there is a clear development in teachers’ practices in fields related to education and learning. This result may, in turn, be dedicated to the central education system that allows teachers to adopt new teaching contents without imposing the content in the textbook on them. They may fell under the accountability in the event of failure to do so. The reason for this result may also be the power and the exercise of teachers in teachers’ preparation programs in the field of sports content, especially if we know that the teacher, throughout their learning in schools for many years, follows methodological changes and emergence o modern teaching method. This may be enough to make them own sport knowledge in a better way. This increases their effectiveness in implementing the sports content as is to be hoped of them. The table also shows that practices by physical education teachers to activate the use of teaching means while explaining sport skills, are few. This may be attributed to lack of

educational activity in sports education classes and the focus on practical aspects. Perhaps the reason is due to the absence of the possibility of material to provide various educational methods and use during explaining sport skills.

The above Table 5 shows arithmetic means of answers of members of the study sample concerning the fifth field/evaluation in a “descending order”. This table shows that arithmetic means of paragraphs of this field ranged between 3.9 and 2.4. Paragraph (7): “Helping in scientific thinking of students” came at first place (mean: 9.3), paragraph (8): “Concentrating on the theoretical field” came at second place (mean: 3.8), paragraph (6): “Help teachers determine difficulties and motor problems of some students and solve them” came at 3rd place (mean: 3.6), paragraphs (1) and (5): “Focusing on motor aspect in evaluation” and “Considering evaluation by goals indication” came at the 4th place (mean: 3.2), paragraph (4) “Validity, reliability and objectivity of evaluation” came at 5th place (mean: 3.00), paragraph (2): “Considering continuity of evaluation” came at 6th place (mean: 2.6), while paragraph (3): “Benefit from evaluation on feedback” came at 7th place (mean: 2.4).

Table 4: Arithmetic means and practice degree for each paragraph of education activities

Serial	Terminology	Rank	Arithmetic mean	Practice degree
1.	Variability of activities, individual & group skills	2	3.2	Great
2.	Concentration on practical aspects of the lesson	3	3	Great
3.	Participation in external sport activities supervised by the education directorate	1	4.2	Great
4.	Considering connection between activities and educational goals	2	3.2	Great
5.	Considering selection of activities that respond trends and desires of students	4	2.6	Great
6.	Organizing internal activities among classes of the same school	1	4.2	Great
7.	Activating the use of educational method during explanation of sport skills	5	2.4	Few
8.	Considering the connection between the activities with environment and society	3	3	Great
9.	The interest in training school teams outside school time	3	3	

Table 5: Arithmetic means and practice degree for each paragraph of evaluation

Serial	Terminology	Rank	Arithmetic mean	Practice degree
1.	Focusing on motor aspect in evaluation	4	3.2	Great
2.	Considering continuity of evaluation	6	2.6	Great
3.	Benefit from evaluation on feedback	7	2.4	Low
4.	Validity, reliability and objectivity of evaluation	5	3	Great
5.	Considering evaluation by goals indication	4	3.2	Great
6.	Help teachers determine difficulties and motor problems of some students and solve them	3	3.6	Great
7.	Helping in scientific thinking of students	1	3.9	Great
8.	Concentrating on the theoretical field	2	3.8	Great

It is noted from results of the study that the degree of the practicing principles of effective teaching related to the field of evaluation by physical education teachers showed that they were practiced largely in general. The mean for the field of application was (2.71). However, arithmetic means for each paragraph of this field have shown the existence of a little percentage by physical education teachers for one paragraph, "to take advantage of evaluation in feedback". Perhaps the reason is not to make a teacher provide his students with, which can significantly contribute to increasing the effectiveness of learning, and integration into attitudes and experiences of learning. Thus, a teacher who is not concerned with feedback cannot contribute to prepare a scientific atmosphere full of security, trust and respect between students themselves, and between them and the teacher.

Furthermore, (Mohammed Salah Sharaf) referred that the success of classroom teaching position requires planning for teaching and learning, correct selection of activities, ways, means and organization, and implementation of activities in accordance with the available effective means and methods, continuous evaluation and benefit from the feedback to improve the processes of teaching and learning. (79: 9).

CONCLUSIONS AND RECOMMENDATION

Conclusions

1. Most of the paragraphs in the field of planning achieved weighing means that exceed the threshold of answers, as weighed means showed some drawbacks due to being lower than the threshold.
2. The degree of practicing effective teaching principles by physical education teachers relating to application showed that they were practiced largely in general.
3. The degree of practicing effective teaching principles by physical education teachers relating to class management showed that they were being practiced largely.
4. Most paragraphs in the field of education received high scores and this showed that the teacher exercised his profession well and there is a clear development in the practice of teachers.
5. The degree of practicing effective teaching principles by physical education teachers relating to evaluation showed that they were being practiced largely.

Recommendations

1. Participation in competitive sports activities, as the Ministry of Education should emphasize the need for physical education teachers to draw attention to training activities for school teams during school day and after school, as this has a reflection on the evolution of skills among students, especially in the lack of provided time for motor exercise.
2. Activating the role of Physical Education supervisors to explain and enrich the information and knowledge of sports education teachers about the need for diversification in the use of direct and indirect physical education teaching methods with replacement with each other to cope with the different students' needs and to achieve diverse goals (motor, cognitive and social) in place for Physical Education.
3. Holding specialized courses and workshops for teachers of physical education to introduce them to the importance of evaluating students and identify the strengths, weaknesses of students and the criteria against which we measure students' progress in motor activities.
4. Emphasizing the need to provide teachers with the theoretical information necessary to help teachers to link teaching physical education and other study materials through publications, workshops and an interest in teacher preparation programs.
5. Develop training programs for teachers that give them the skills and expertise on evaluation in the light of the teaching with competencies.
6. Improve the quality of formation to allow the development of educational skills of teachers.
7. Connecting channels of communication and dialogue between faculty researchers and practitioners in the field (inspectors and teachers) for scientific benefit.
8. Creating banks for evaluation situations, build tests and networks of evaluation to facilitate the work of the teacher and establish objectivity and accuracy of the results and evaluation.

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The Effect of using Blended Learning in Situation-Embarrassment and Hand Stand Skill in Parallel Bar for Men

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ABSTRACT

This study includes an introduction, problem, objectives, hypotheses, scopes and field procedures of the study. The researchers used the empirical method as it is appropriate to the problem. Population of the study is represented in students of the third stage of gymnastics lesson for men in Faculty of Physical Education, Wasit University. The sample was divided into two groups (empirical and control groups). The learning-embarrassment scale was also used as a test of the sample with skill performance of hand stand skill in men's parallel bar. Statistical means were used in data treatment using Statistical Package for the Social Sciences (SPSS). Results were presented and discussed using a discreet scientific method. The researchers concluded that: There were significant results in pre- and post- tests for the empirical group in situation-embarrassment and skill performance of hand stand skill in men's parallel bar, there were significant results in pre- and post- tests for the control group in situation-embarrassment and skill performance of hand stand skill in men's parallel bar and there were significant results in post- tests for the empirical and control groups in situation-embarrassment and skill performance of hand stand skill in men's parallel bar.

Keywords: Situation-embarrassment, blended learning, men's gymnastics

INTRODUCTION

Progress in all sport fields was made through studies, research, teaching and learning, which is one of the areas of physical education as it plays an important role in learning and the development of individual sportsmen. In addition, its involved people deliver information to learners by different teaching and educational methods. The researchers are trying to find the best methods of teaching to communicate information to

the learner, so the teacher resorted to use new methods in teaching with a style other than usual style to provide information to students and make them access a high degree of performance. These methods transform the role of the students from being receivers of information to the role of mentors to give responsibility to students during performance application, and these methods. Among these methods, there is the blended learning style, which is one of the relatively modern teaching strategies, focusing on improving the quality of learning of students and allowing the interaction between a student and his colleagues, leading to effective positive participation from his side. Thus, a student turns from a mere recipient into an effective and associate member in blended learning groups. It is also a system that integrates between the way ordinary method and e-learning online to direct and assist the learner through each stage of learning, as one of the modern portals

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based on using educational technology in designing new educational situations. Through performance applications within the lesson, learning-embarrassment happens. It is defined as “an emotional state in which a student feels disorders of thinking, performance, hesitation and shyness in the presence of others, which inevitably will affect performance” (14: 1). It is also defined as “a blended system designed to help the learner through each stage of learning, and is based on a combination of traditional education and e-learning’s different forms of inside classroom”.

Among conditions of blended learning: (good planning to employ e-learning technology in blended learning environment, determine the function of each means in the program, how to use it by teachers and learners carefully and ensure the skills of teachers and learners in using e-learning technology involved in the blended learning environment, ensure availability of devices, references and various sources used in the blended learning environment, whether for learners or educational institution in order not to represent a constraint for learning, starting the program with a general session bringing together teachers and learners face to face to explain the program’s objective, how to implement its plan, the strategies used in it, the role of each of them in learning events, work on the presence of teachers in a timely manner to respond well to inquiries of learners, either online or in face-to-face lessons) (56: 2).

Among the advantages of blended learning: (dramatically reducing learning costs compared to e-learning alone and providing face-to-face communication; which increases interaction between the student and instructor, students and each other, and students with content and promoting human aspects and social relations among the learners themselves and between teachers, sufficient flexibility to meet all individual needs and learning styles of learners depending on levels, ages and times, taking advantage of technological advances in the design, implementation and use) (99: 4).

Gymnastics apparatus is one of the practical lessons in Faculties of Physical Education with multiple skills and moves and requires good and high skill level, so it depends on the student’s effort. It is necessary to use different and new teaching methods through lesson in learning to provide students with information concerning the given skills, especially hard ones as they require high accuracy in implementation and practice in order to reach optimal performance. Here, the

significance of the study is clear in: Determining the effect of using blended learning method in situation-embarrassment and learning hand stand skill in men’s parallel bar due to various physical characteristics of students in order to develop skill levels in gymnastics.

PROCEDURES OF THE STUDY

The researchers used the empirical method as it is appropriate to nature of the study problem.

Population & Sample of the Study

The population of the study consists of students of the third stage of gymnastics lesson for men in Faculty of Physical Education, Waset University for the academic year 2014–2015 (40 students). The sample of the study consists of (10) students participating in the main trial divided into two groups (empirical and control groups) and 5 students in each group in addition to another 5 students who participated in the exploratory trial and others were eliminated for non-compliance to attend the research plan.

Tools and Devices used in the Study

- Arabic and foreign references.
- Parallel bar device with different heights for men.
- Ground mat.
- 2 stop watches.
- Data Show device.
- HP laptop.
- Sony video camera.
- 5 CDs.
- 2 video tapes.

Field Procedures of the Study

The used methods

The researchers used blended learning method to determine the type of effects achieved for students such as cooperative work and responsibility compared with the adopted method of the faculty. In addition, it is selected as a kind of usage of different methods in men’s gymnastics.

Embarrassment-situation scale

The researchers used situation-embarrassment scale created by (Ban Adnan Mohamed used in physical education with high validity and reliability. The scale consists of (42) paragraphs (Annex 1). In order to appropriation with problem of the study, the researchers

presented it to a group of experts and specialists in sport psychology.

The used skill in the study

After reviewing items of courses of gymnastics lesson in Faculty of Physical Education for men, Waset University, the hand stand skill in men's parallel bar was selected. This is the hardest skill in the faculty's course after consulting the group of gymnastics experts and specialists.

Empirical design of the study

The researchers used empirical design of equal groups with pre- and post-tests as shown in Table 1.

Exploratory trial

The exploratory trial was performed on (01/03/2014) for variables of the study on (5) students outside the sample of the study in order to determine:

- Validity of the academic course using the blended method in application.
- Difficulties and obstacles faced by the researchers during application of the method.
- Ensuring efficiency of the assistant team.
- Ensuring validity of devices and tools used in the study.
- How the extent accepts the selected procedures of the study.

Pre-Tests

Pre-tests were conducted for all groups of the study (measuring situation-embarrassment and skill performance of hand stand skill in men's parallel bar) on 03/03/2014 in the gymnastics hall at the Faculty of Physical Education, Waset University with the help of the assistant working team.

The prepared educational course

The researchers prepared the educational course aiming at learning hand stand skill at men's parallel bar for students of Physical Education depending on discrete scientific resources and references. The educational course includes (8) educational units for (4) weeks (2 units a week). The period of each unit is (90) minutes

divided into three parts (preparatory part, main part and final part). There was similar teaching in groups of the study in preparatory and final parts of the lesson, while the difference in teaching in empirical group was only in the main part in addition to the use of a set of physical exercises to develop learning the skill as follows:

- The Empirical Groups: A certain course of blended learning after reviewing discrete scientific sources and presenting on a group of experts and specialists in the field to be approved:
 - (i) Teaching the empirical group using blended learning.
 - (ii) The researchers explained the skill in a good and clear way to students.
 - (iii) The researchers presented the skill in pictures and video clips using the data show to help explain steps of learning the skill for students.
 - (iv) After explaining the skill, presenting pictures and videos of the skill, it was applied by students.
- The Control Group
 - (i) The control group was taught using the adopted learning method of the faculty by subject teachers.
- Note: Items of the educational course were applied on 04-06/03/2014 and for the rest of weeks (on Tuesday and Thursday of each week).

Post-Tests

Post-tests were conducted for groups of the study on 31/03/2014 with the same conditions and settings of pre-tests.

Performance evaluation

In order to evaluate the performance of students, the researchers videotaped the skill pre- and post-tests and evaluation was made by specialists in men's gymnastics through a special form for performance evaluation noting that the score is only (5) as it is only a skill.

Statistical means

Statistical means were used in data treatment using Statistical Package for the Social Sciences (SPSS).

Table 1: Empirical design of the study

Groups	Pre-test	The used method	Post-test
Empirical group	Test of learning research skill and embarrassment-situation measurement	Blended learning method	Test of learning research skill and embarrassment-situation measurement
Control group	Test of learning research skill and embarrassment-situation measurement	The faculty's adopted method	Test of learning research skill and embarrassment-situation measurement

- Note: Arbitrators:
 - (i) Prof. Dr. Ahmed Tawfik – Salah El Din University – Apparatus Gymnastics.
 - (ii) Prof. Dr. Abduljabbar Abdulrazek – Al Mawsel University – Apparatus Gymnastics.
 - (iii) Dr. Rah Roz Rostum – Sport Institute at Koya City – Apparatus Gymnastics.

PRESENTING & DISCUSSING RESULTS

Table 2 shows the variables of the study (situation-embarrassment and skill performance of hand stand skill in men's parallel bar) with statistically significant differences at level (0.05) and freedom degree (4) in favor of post-measurements and tests of the empirical group.

The researchers attribute the reason for significant differences in these tests for the empirical group to the fact that the course they prepare has contributed to make great changes in the level of students' performance and their commitment to implement items if the adopted course with their insistence on continuing to learn the skill through selected exercises. In addition, blended learning produces a stronger

societal sense for students when compared with students who receive traditional learning which leads to increase performance speed in tasks. Here, we can notice that adopting modern techniques in teaching and learning to contribute effectively to the education process's success.

Table 3 shows that variables of the study (situation-embarrassment and skill performance of hand stand skill in men's parallel bar) with statistically significant differences at level (0.05) and freedom degree (4) in favor of post-measurements and tests of the control group.

The researchers attribute the reason for significant differences in these tests for the to the adopted traditional method in the faculty and it also contributed to positive changes but not at the needed level compared with blended method and as the original sample is for students and the skill is learned as being within items of the course.

Table 4 shows that variables of the study (situation-embarrassment and skill performance of hand stand skill in men's parallel bar) with statistically significant

Table 2: Values of arithmetic means, standard deviations sds (pre- and post-tests) for the empirical group in situation-embarrassment and skill performance of hand stand skill in men's parallel bar

Variables	Pre-tests		Post-tests		Counted (T)	Tabulated (T)	Significance
	Mean -	SD ±	Mean -	SD ±			
Situation-Embarrassment	134.8	5.19	187.4	4.22	14.45	2.133	Significant
Skill performance	1.56	0.59	3.87	4.0	8.61		Significant

Freedom degree (4) under significance level (0.05)

Table 3: Values of arithmetic means, standard deviations sds (pre- and post-tests) for the control group in situation-embarrassment and skill performance of hand stand skill in men's parallel bar

Variables	Pre-tests		Post-tests		Counted (T)	Tabulated (T)	Significance
	Mean -	SD ±	Mean -	SD ±			
Situation-Embarrassment	1163	8.23	120.6	5.2	2.69	2.133	Significant
Skill performance	2	0.63	1.75	0.61	2.703		Significant

Freedom degree (4) under significance level (0.05)

Table 4: Counted and tabulated (T) values for pre- and post- tests and with empirical and control groups in situation-embarrassment and skill performance of hand stand skill in men's parallel bar (or) Values of arithmetic means, standard deviations sds (pre- and post-tests) for the control group in situation-embarrassment and skill performance of hand stand skill in men's parallel bar

Variables	Counted (T)	Tabulated (T)	Significance
Situation-Embarrassment	5.729	2.133	Significant
Skill performance	20		Significant

Freedom degree (4) under significance level (0.05)

differences at level (0.05) and freedom degree (4) in favor of post-measurements and tests of the control and empirical groups.

The researchers attribute the reason for significant differences is that the educational course was selected in a mastering method and as new among the used methods. This contributed to great developments in skill performance and ending the state of embarrassment for students during their performance of the most difficult motor skills and in front of their colleagues.

In addition, blended learning seeks to make interactive learning not prompt one (220:6). Embarrassment is subject to the (feature-state) perspective. This means that embarrassment is considered a feature through the individual's preparation towards embarrassment and a case of embarrassing social situation. However, the trend towards considering embarrassment as an emotional state happens in specific situations and ends by the end of situations, not just a prejudice towards a theoretical trend without justification. There is an indication to situation-embarrassment and continuous embarrassment. In fact, most individuals are exposed – in a certain stage or another in their lives or certain conditions – to feel embarrassed, while there is a less percentage who suffers from embarrassment continuously, so it may seem possible that embarrassment sometimes be a feature for some individuals and a state conditioned by certain social situations for other people (48:7).

CONCLUSIONS

1. There were significant results in pre- and post- tests for the empirical group in situation-embarrassment and skill performance of hand stand skill in men's parallel bar.
2. There were significant results in pre- and post- tests for the control group in situation-embarrassment and skill performance of hand stand skill in men's parallel bar.
3. There were significant results in post- tests for the empirical and control groups in situation-embarrassment and skill performance of hand stand skill in men's parallel bar.

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ANNEXES

Annexes image



Picture of the hand stand skill

Annexes Tables

Annex 1: Situation-Embarrassment scale

Serial Paragraphs	Exactly matching	Greatly matching	Quite matching	Does not quite match	Does not match at all	Remarks
Score	5	4	3	2	1	
1.						I have the ability to control my performance well during the educational unit
2.						I have a high desire to the gymnastic lesson make me my best performance during the module
3.						I can control my emotions during performance of the difficult basic skill
4.						I face difficulty in controlling my emotions during practical exam
5.						I face difficulty in controlling my emotions during theoretical exam
6.						I find it difficult to control my emotions while performing some of the difficult basic skills such as hand stand on parallel bar
7.						My calm temper helps me control my performance during the educational unit
8.						My calm temper helps me control my performance during practical exam
9.						I cannot control my emotions when students criticize my performance during the educational unit
10.						My calm temper differs during the educational unit than in the practical exam
11.						My calm temper differs during the educational unit than in the theoretical exam
12.						I have great confidence in my skill and fitness
13.						I avoid competing with the students with a high-level performance skills in the educational unit
14.						It is not my nature to face the challenge of students among them
15.						I lack confidence in my performance skills in hand stand skill on the parallel bar during the practical exam

(Contd...)

Annex 1: (Continued)

Serial Paragraphs	Exactly matching	Greatly matching	Quite matching	Does not quite match	Does not match at all	Remarks
Score	5	4	3	2	1	
16.						Repeating my mistakes in the course of the module increases the lack of my self-confidence
17.						My performance level drops in educational units watched by some trainers
18.						My physical abilities and fitness are not good because I do not train well
19.						I am a slow in understanding and comprehension of the instructions of the teacher during the unit
20.						I may face difficult skill requirements in gymnastics during the practical exam
21.						I am satisfied with my skill ability to perform the hand stand skill in gymnastics
23.						I feel satisfied when I perform the hand stand skill in gymnastics
24.						It is difficult to refocus my attention if I made mistakes in performance during the educational unit
25.						Criticism of the teacher or colleagues of performance distracts my attention towards good skill performance
26.						Negative opinions of students on my performance do not prevent me from good concentration on practical exam
27.						Negative opinions of students on my performance do not prevent me from good concentration on theoretical exam
28.						I can focus well on the skill only during the educational unit
29.						My attention is distracted when I hear remarks of teacher about my performance of hand stand skill on the parallel bar
30.						I focus my attention well during performing practical exam despite students' criticism
31.						I worry too much when he made a mistake in performance during the theoretical exam
32.						I feel nervous during teacher's valuation of my negative performance during practical exam
33.						I worry when the teacher scolds me for the poor performance during the educational unit
34.						I do not worry when my mistakes increase during performing other skills on parallel bar with different heights
35.						I worry a lot before starting my hand stand skill performance on the parallel
36.						I feel so annoyed when it becomes hard for me to correct my mistakes during performance in the educational unit
37.						I do not train alone much or away from students outside this educational unit
38.						I try to stay away from the rest of the students before my performance of this skill during a practical exam
39.						I do not consort quickly with the students during the educational unit
40.						I try to set up good relations with the students during the educational unit
41.						I avoid accepting opinions of students about my performance of the hand stand skill on the parallel bar during practical exam
42.						I worry a lot when I do not understand the teacher's explanation of the skill

Annex 2: A model of educational unit using blended learning

Unit	1	Learning hand stand move		Unit period	90 minutes
Number of students	5			Stage	3
Place	The indoors hall of apparatus gymnastics				
Sections of units		Time	Unit details	Order	Remarks
Preparatory section	Introduction	5 mins	Taking absents and preparing tools	x xxxxx x	Ensuring correct standing
	General warming-up	7 mins	General warm-up to prepare all body organs	x xxxxx x xxxxx x xxxxx x	Warm-up for all students
	Private warming-up	15 mins	Private warm-up appropriate and beneficial to the main part of the lesson		
Main section	Educational Part	20 mins	Explaining the move, how it is performed and model presentation by teacher	x xxxxx x x x	Movement presentation on the data show for only (3) minutes
	Applied Part	35 mins	<ul style="list-style-type: none"> • Projecting vireos of the move using data show • Performing exercises given by the teacher • Applying the movement by the sample 	x xxxxx x xxxxx x	
Final section	Preparation & Relaxation	6 mins	Members of empirical study group return to be integrated with the rest of class members to perform exercises set by the teacher in the final part	x xxxxxxx	
	Dismissal	2 mins	Dismissal		

Note: presentation period gradually increases from (3) to (5) minutes to present the skill in projector.

Assessment of Standard, Self-Adapted Mouthguards in Terms of Comfort and Use in Handball, Basketball, and Field Hockey

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ABSTRACT

The objective was to provide player's general assessment of a "boil-and-bite" and two-component mouthguard in terms of comfort and subjective impressions in handball, basketball, and field hockey. Additionally, the orofacial trauma experience was investigated. Awareness of mouthguard as a preventive device was 100 % in basketball, 82.5 % in field hockey, and 71.4 % in handball, but only one basketball player and none in handball wore a mouthguard. The most frequent reason for no mouthguard use was "never thought about this". 84.2 % of the field hockey players used always a mouthguard in games, and 36.8 % in training. The most frequent source of advice were coaches/club members (66.6 %). 57.7 % from 44 participants who used no mouthguard had orofacial injuries (soft tissue laceration 59.6 %, concussion 27 %, tooth fracture and loss 26.6 %, jaw fracture and luxation 13 %). The incidence of trauma shows that educational campaigns about mouthguard use need to be directed to the coaches, clubs, families and players.

Keywords: Mouthguards, mouthguard comfort, sports-related injury, orofacial trauma

INTRODUCTION

Sports participants are at risk for unique and distinct kinds of dental injuries. Direct trauma from a high-velocity object, such as a baseball or (field) hockey ball that strikes the front teeth, is likely to cause a fracture. High-velocity trauma is more likely to fracture the teeth, whereas low-velocity trauma causes the greatest damage to the hard and soft tissues that surround the teeth. Any traumatic dental injury has the potential to challenge pulp vitality even if not apparent initially.

The resulting number of sports-related injuries was the occasion for numerous studies on the need to wear a mouthguard during several sporting activities. The first historic use of gum shields was found 1913 in the British boxing sport. This historic gum shield was made from natural rubber, which was held in position by keeping the teeth together. 1962 determined the "American Dental Association" the obligatory wearing of a mouthguard in US high school football. Guidelines for mouthguard use in sports have been developed by the Academy for Sports Dentistry and the American Academy of Pediatric Dentistry (1, 2). The National Collegiate Athletic Association requires the use of a mouthguard in 4 sports (football, ice hockey, field hockey and lacrosse), and the American Dental Association recommends the use of mouthguards in 29 sports and fitness activities (3). The German Society of Oral and Maxillofacial Surgery (DGZMK) recommends at least 15 sports, among others, handball,

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basketball and hockey, the wear of a mouthguard (4). Knapik (2007) performed studies on the physical properties and materials of a mouthguard (5). Earlier they were even of simple latex rubber, but today they are produced from different plastics such as polyurethane, ethylene-vinyl acetate (EVA) or polyvinyl chlorides. Often they are made from compounds of plastics, which give the mouthguard both elastic and rigid properties.

Generally 39 % of all oral and dental injuries are sports-related. Basically all sports with risk of falling, player contact and devices, especially balls or hockey sticks, have an increased risk for teeth and jaws. Even small forces can damage or fracture the teeth. A tooth can already brake when a compact plastic ball of 160 g (hockey) from a height of 2 meters simply bounces on the mouth without active acceleration. According to the Dental Association in Schleswig-Holstein, Germany, an efficient, comfortable, and properly-fitted mouthguard can reduce the sports-related dental injuries up to 60 %. It protects tongue, lips and cheeks against bite-lesions. The mouthguard absorbs blows and shocks due to its elasticity. On the other hand it is rigid enough to spread the energy away from the teeth to larger surfaces. In consequence of shock absorbency and force distribution alveolar and dental fractures are minimized, and concussions occur up to 16 fold fewer. An absolute indication for a mouthguard is an overjet greater than 3 mm or an insufficient lip-closing. A reduction in dental injuries has been demonstrated in sports where mouthguard use is mandatory, such as American football and ice hockey (6-8). In an *in vitro* animal model, the force required to damage dento-alveolar structures was increased by 14-fold for the permanent dentition (9) when a mouthguard was worn. The action of mouthguards in reducing extra-oral injuries has been demonstrated using lateral cephalometric radiographs. With a mouthguard in place, the mandibular condyles are positioned antero-inferiorly, preventing normal closure. This significantly reduces the risk of concussion following traumatic closure of the mandible, especially in individuals predisposed to such injury (10, 11). Although sports-related dental injuries cannot be eliminated entirely, many can be reduced in severity or prevented with the use of a properly fitted mouthguard (12-15).

Despite the clear potential of mouthguards to reduce the risk of injury, many athletes do not use them. They believe mouthguards inhibit breathing, gas exchange,

and communication. There are different models of mouthguards available. We tested two commercially available models (one boil-and-bite vented and one custom fit two-component mouthguard) because they may be used more frequently than professionally fitted individual ones due to extreme differences in cost and accessibility.

It is the intention of the present study to check the wear, comfort and subjective impressions of mouthguards in athletes, who do not contact (volleyball), contact directly (field hockey) or indirectly (handball) with competition rivals. Players' knowledge, attitudes, and current mouthguard use need to be determined in order to direct educational resources and develop effective promotional messages.

There are 5 major aims of the present study: to check the use of mouthguards by these players and their reasons; to assess the comfort and wear characteristics of the two mentioned mouthguard types in handball and basketball in games and a sports specific agility test; to compare the regularly worn mouthguard of the field hockey players with the rating of the two mouthguards offered in our study; to assess a possible difference between the wear characteristics; and to describe the players' experience in orofacial injury.

METHODS

Experimental Approach

The experimental part of the present study in handball and basketball players used a within-subject repeated-measures design. The subjects had to report on two days twice (morning and afternoon). At first, subjects were informed about the experimental procedures and provided with both mouthguards used in this investigation. The experimental sessions occurred on two consecutive days. The subjects completed a series of physical agility tests and a match. During all activities, subjects wore the predetermined mouthguard assigned to that experimental session. In the basketball and handball groups the experimental sessions were applied in a randomized counterbalanced way. After each session a questionnaire was completed by the players to assess the comfort and possible complaints in the use of the two different types of mouthguards. No experimental session was conducted with the field hockey players. They completed a questionnaire about the comfort and possible complaints of their usually worn mouthguard.

Subjects

45 subjects were enrolled in this study by completing a consent form. Players recruited were male youths from the handball A-team of Sports Club Magdeburg (17-19 year olds, elite, n= 14), male adults from basketball (Second league, Leipzig (19-37 year olds, n= 8), and 19 female and 4 male youths and adults from Hockey Club Leipzig (all levels; social to elite: 9-12 year olds (n= 8), 15-19 year olds (n= 6), 20-30 year olds (n= 5), and over 30 (n= 4)).

Mouthguards

The purpose of this investigation was to describe the impact of boil-and-bite mouthguards on comfort and subjective impressions. Boil-and-bite mouthguards may be used more frequently than a custom-fitted model because of relevant differences in cost and accessibility. The mouthguards provided in the present study were the commercially available vented boil-and-bite mouthguard (VentMG), and the two-component custom fit mouthguard (MixMG), applied in the handball and basketball groups. All mouthguards were fitted to the participants by one dentist using the instructions provided on the packaging.

During the VentMG condition, the handball and basketball players wore a Nike adult max intake convertible mouthguard (Nike, Beaverton, OR, USA). This mouthguard has breathing channels designed to improve ventilation and gas exchange during sports performance. The mouthguard was placed in boiling water for 30 seconds, taken out and the water was gently shaken off. Then the mouthguard was carefully placed in the mouth to cover the upper teeth, and the subject was instructed to firmly bite down. Moderate pressure was placed on the lips and cheeks for 30 seconds. The mouthguard was then removed and washed with cold water.

During the MixMG condition, the custom fit two-component mouthguard (MixMG) was prepared according the packaging instructions. Powder and liquid were mixed with a spoon to a soft mass, then filled into a plastic occlusal template and placed in the mouth to cover the upper teeth. This mouthguard type was chosen because the soft mass adapted perfectly to the contour of each tooth, hardened in the mouth and got individualized. Excessive material and sharp contours were removed.

None of the described versions was used in the field hockey players since they used their regularly worn mouthguard (Dita Multi Sport Senior or Junior) and reported about the comfort and reasons of wearing.

Questionnaires

First a questionnaire was used to ascertain the mouthguard wear, awareness, attitudes and the reasons for using and not using in all 45 players (handball n= 14, basketball n= 8, field hockey n= 23). Additionally the dentofacial trauma experience was asked by the questionnaire. The incidence of trauma was recorded over the entire career of an athlete (usually retrospective). Similar questions have been used in previous study (16).

The second questionnaire assessed the comfort, subjective impressions, and complaints of mouthguard wear. The questionnaire was administered once to the field hockey players and twice to the handball and basketball players to evaluate both provided study mouthguards. In a scale from 0 (bad) to 10 (excellent) the mouthguard was categorized concerning fit, stability when running, comfort, interference in breathing, speaking, and drinking. In a scale of 0 (not at all) to 5 (extremely) the players should evaluate the mouthguard for possibly resulting dry mouth, thirst, burden, nausea, and retching.

Statistical Analysis

All data are presented as means \pm SD. Analysis of groups was done using the Mann-Whitney U test, and independent t-test. A p-value of $p < 0.05$ was considered to indicate significance, and $p < 0.005$ as very significant. All analyzes were performed using the program Statistical Package of Social Science (SPSS) Version 21.0.

RESULTS

Mouthguard Wear Characteristics

In field hockey, 82.6 % (n= 19) used a mouthguard. Knowledge of the protective role of a mouthguard was the main reason for the use in field hockey (85.7 %), followed by the reason that other players had one (9.5 %), and advice by another player (4.8 %). The most frequent sources of mouthguard advice were club, trainer, and team members (66.6 %), followed by family and friends (29.2 %). The only female player, who had

a professionally fitted mouthguard, had made up her decision for the use after an injury of a team member. A boil-and-bite mouthguard (Dita Multi Sport), provided by the hockey club, was used by 18 players (78.3%). The age of the mouthguards differed between less than 6 months (42.1%), 6-12 months (31.6%), and 2 years and over (26.3%). Mouthguard wear was less frequent in training (36.8%; always) than at games (84.2%; always). The most frequent reasons for not always wearing a mouthguard in field hockey were “speaking interference” (30.6%), followed by “breathing interference” (22.2%), “uncomfortable to wear” (16.7%), “never thought about it” (13.9%), “not at high risk for dental injury” (8.3%), and “friends don’t wear them also” (5.6%). Two female players reported that the wearing is a purely mental thing, because they feel uncomfortable in the game without a mouthguard. 19 (82.6%) from 23 field hockey players believed in the protective role of mouthguards, 4 were unsure. 68.2% found it necessary to wear a mouthguard in training sessions, 18.2% not, and 13.6% were unsure. In games found 81.8% the wear of mouthguards necessary, 9.1% not, and 9.1% were unsure.

In basketball, only one from 8 basketball players reported to wear a professionally fitted mouthguard due to an earlier tooth fracture; none of 14 handball players had used a mouthguard before. The most frequent reasons of the basketball players to use no mouthguard were “never thought about it” (30.8%), followed by “uncomfortable to wear” (23.1%), “speaking

interference” (15.4%), and 7.6% each “breathing interference”, “not at high risk for dental injury”, and “a lot of effort”. All basketball players believed in the protective role of mouthguards for orofacial injury, 4 thought that mouthguards are necessary in matches, and only one player thought mouthguard wear is necessary in training sessions, 3 were unsure for mouthguard use in training and one to use wear at games.

In handball, the most frequent reasons to wear no mouthguard were “never thought about it” (27.2%), followed by 13.6% each “breathing interference”, “speaking interference”, “not at high risk for dental injury”, and 13.6% gave no answer. One handball player mentioned the uncomfortable wear and another one answered that “friends also don’t wear a mouthguard”. 10 (71.4%) from 14 handball players believed in the protective role of mouthguards, 3 were unsure and one abstained. Only 2 players thought that mouthguard use might make sense in games, no one thought this for training. 7 players were unsure and one abstained.

Figure 1 shows the attitudes of players in handball and basketball toward mouthguard use in training and games. Nevertheless a majority of the total participants (81.8%) advocates the general usefulness of mouthguards in protecting teeth and jaws.

Out of the 45 players (all sports together) 44.4% used a mouthguard, and 55.6% used no mouthguard. The

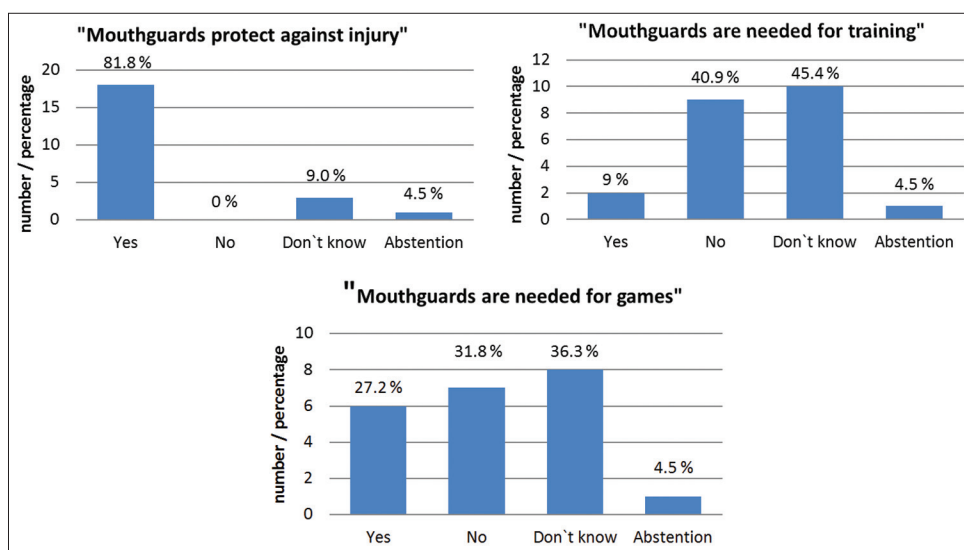


Figure 1: Attitudes of 22 basketball and handball players towards mouthguard wear

reasons for not wearing a mouthguard are shown in Figure 2.

Distribution of Orofacial Injuries

62.5 % of the basketball players had previous orofacial injury, in 57 % soft tissue injuries (lip or cheek laceration), and in 43 % hard tissue injuries occurred (mandible luxation, tooth fractures, or tooth loss; each 14.3 %). After tooth fracture one basketball player (29 years old) got a professionally fitted mouthguard made by his dentist. His current mouthguard was 1.5 years old. He always wore it, in training sessions as well as in games. He was convinced about its protective role and injury prevention.

50 % of the handball players had no previous orofacial injury, whereas 18.7 % suffered from lip/cheek lacerations, concussion (12.5 %), tooth fracture (12.5 %), and jaw fracture (6.3 %).

In field hockey the wear of a mouthguard was compared for those who had or had no previous orofacial injury. 70.8 % (n= 17) had no previous orofacial injury, 4 players sustained lip/cheek laceration and 2 had a concussion. From 19 players who used a mouthguard 3 had lip/cheek laceration and no other dentofacial injury. Concussions and orofacial laceration occurred in 3 from 4 players who never had used a mouthguard.

28 (62 %) of all participants had no orofacial trauma experience. The remaining 17 players reported 22 injuries; multiple answers were possible. The most common injuries were lip/cheek lacerations (22 %). All answers are given in Figure 3.

The distribution of orofacial injuries is given separately for handball, basketball, and field hockey in Table 1. In field hockey, the injuries are related to mouthguard wear.

The distribution of orofacial injuries in the groups (multiple answers were possible, n= 50; MG= mouthguard)

RESULTS FOR THE ASSESSMENT OF THE PROVIDED AND TESTED MOUTHGUARDS IN BASKETBALL AND HANDBALL

In a scale from 0 (bad) to 10 (excellent) the vented Nike adult max intake mouthguard (VentMG) and the

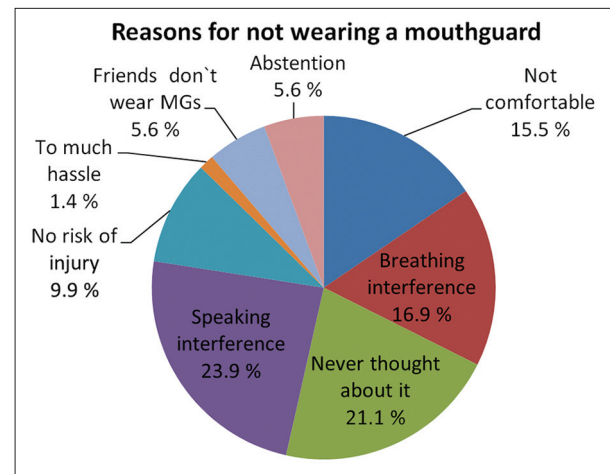


Figure 2: Distribution of reasons (n= 70) given by 45 players for not wearing a mouthguard

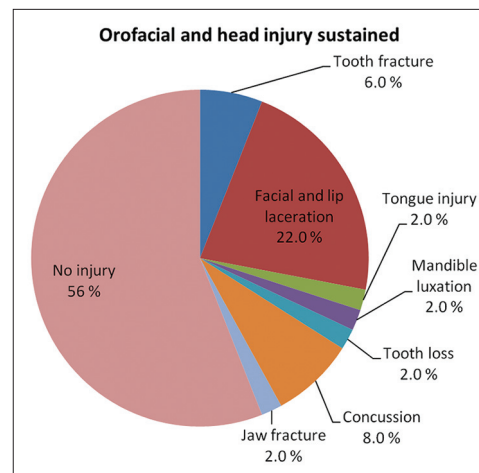


Figure 3: Distribution of no injury and trauma and orofacial injuries occurring in handball, basketball and field hockey together (Answers: n= 50)

Table 1: Distribution of orofacial injuries

Orofacial injury sustained	Hand ball n=14	Basket ball n=8	Field Hockey	
			With MG n=19	No MG n=4
Tooth fracture	2	1	0	0
Tooth loss	0	1	0	0
Tooth loosening	0	0	0	0
Concussion	2	0	0	2
Jaw fracture	1	0	0	0
Mandible luxation	0	1	0	0
Tongue injury	0	1	0	0
Lip/cheek laceration	3	3	3	2
No injury	8	3	16	0

The distribution of orofacial injuries in the groups (multiple answers were possible, n=50; MG: Mouthguard)

two-component mouthguard (MixMG) were evaluated in the handball and basketball players concerning the fitting, stability in running, comfort, interference in breathing, speaking, and drinking. The assessment was given after a sports specific physical agility test and after a game and analyzed together, because no significant differences were observed (Table 2). The interference of speaking was rated worse than all other parameters, and the impact on speaking ability was classified significantly worse for the VentMG ($p < 0.005$).

The perceptions of comfort, interferences, and stability of the two provided study mouthguards were compared to the usually worn mouthguards of the field hockey group. One female field hockey player was excluded from the assessment of mouthguard comfort because she had

a professionally fitted mouthguard. The boil-and-bite mouthguard (provided by the club; Dita Multi Sport) of the remaining 22 field hockey players was compared to the reviews of the two study mouthguard types (Nike vented adult max intake (VentMG) and the two-component mouthguard (MixMG)) (Table 2). Perceptions of the ability to communicate and drink were consistently the most negative. The interference in speaking with the MixMG was characterized as significantly less, when compared to the boil-and-bite mouthguard of the field hockey players ($p < 0.003$), and VentMG ($p < 0.005$). The interference in drinking was markedly worse for the boil-and-bite field hockey mouthguard than for the two study mouthguards ($p < 0.0001$).

A comparison between the two study mouthguard types showed a significant difference in the interference

Table 2: Evaluation of mouthguard characteristics for BBHo (field hockey) versus VentMG and MixMG (basketball and handball) after a physical agility test and a game

Evaluation of MG	Distribution of responses (n; valid %)					Mean value	N
	10, 9 Excellent	8,7	6,5	4,3	2,1, 0 Bad		
Fitting							
MixMG	8 (27.6)	11 (38)	5 (17.2)	4 (13.8)	1 (3.4)	6.90±2.45	29
VentMG	7 (18)	15 (38.5)	10 (25.6)	2 (5)	5 (12.8)	6.33±2.41	39
BBHo	7 (31.8)	9 (40.9)	4 (18.2)	0	2 (9.1)	7.18±2.20	22
Stability							
MixMG	5 (14.7)	13 (38.2)	7 (20.6)	5 (14.7)	4 (11.8)	6.15±2.48	34
Vent MG	8 (20)	12 (30)	14 (35)	3 (7.5)	3 (7.5)	6.28±2.20	40
BBHo	9 (40.9)	5 (22.7)	6 (27.3)	1 (4.5)	1 (4.5)	7.32±2.44	22
Comfort							
Mix MG	6 (17.6)	14 (41.2)	4 (11.8)	5 (14.7)	5 (14.7)	6.29±2.75	34
VentMG	1 (2.5)	19 (47.5)	6 (15)	6 (15)	8 (20)	5.36±2.44	40
BBHo	2 (9.1)	11 (50)	3 (13.6)	4 (18.2)	2 (9.1)	5.95±2.48	22
Breathing							
MixMG	5 (14.7)	16 (47)	4 (11.8)	7 (20.6)	2 (5.9)	6.41±2.38	34
VentMG	2 (5)	17 (42.5)	14 (35)	4 (10)	3 (7.5)	5.95±1.93	40
BBHo	4 (18.2)	7 (31.8)	3 (13.6)	7 (31.8)	1 (4.5)	6.09±2.67	22
Speaking							
MixMG	0	12 (36.4)	12 (36.4)	5 (15.2)	4 (12)	5.52±2.05**	33
VentMG	1 (2.6)	5 (12.8)	10 (25.6)	12 (30.8)	11 (28.2)	4.10±2.21	39
BBHo	0	1 (4.5)	10 (45.5)	5 (22.7)	6 (27.3)	3.86±2.12	22
Drinking							
MixMG	2 (8)	8 (32)	10 (40)	2 (8)	3 (12)	5.88±2.39	25
VentMG	3 (10.4)	4 (13.8)	9 (31)	6 (20.7)	7 (24.1)	4.93±2.75	29
BBHo	0	0	2 (9.1)	3 (13.6)	17 (77.3)	1.41±1.76***	22

Evaluation of mouthguard characteristics (from 0 (bad) to 10 (excellent); n; %). Abbreviations: MG: Mouthguard, MixMG: Two-component mouthguard, VentMG: Vented Nike adult max intake, BBHo: Boil-and-bite mouthguard of field hockey players, **: Significant, ***: Very significant

in speaking which was higher in the VentMG wear ($p < 0.05$ vs. $p < 0.02$) (Table 3). No significant differences were seen in the categories of fitting, stability on running, comfort, and breathing, classified in an average of 5 to 7 from 10 (Table 3).

In a scale of 0 (not at all) to 5 (extremely) the players should rate the mouthguard for dry mouth, thirst, burden,

nausea, and retching. No significant differences between the mouthguard types were observed (Table 4).

No significant differences concerning individual complaints were found between the VentMG and MixMG after physical agility tests and after games (Table 5). Also no significant differences were found in the categorization of characteristics for each

Table 3: Evaluation of mouthguard characteristics for VentMG and MixMG separately after the physical agility test and game

Parameter	VentMG After physical agility test	MixMG After physical agility test	VentMG After game	MixMG After game
Fitting	6.81±2.17	7.23±2.62	6.00±2.59	6.5±2.24
Stability	6.60±2.39	5.94±2.38	6.19±1.99	6.00±2.69
Comfort	5.70±2.54	6.18±2.81	5.12±2.30	6.41±2.76
Breathing	6.08±1.84	6.00±2.57	6.00±2.00	6.82±2.16
Speaking	4.47±2.46	5.94±2.17*	3.62±1.99	5.12±1.90*
Drinking	5.00±2.77	6.00±1.81	5.00±2.78	5.77±2.89

Evaluation of mouthguard characteristics (from 0 (bad) to 10 (excellent); n; %, p value). Abbreviations: MixMG: Two-component mouthguard, VentMG: Vented Nike adult max intake, *: Significant

Table 4: Evaluation of BBHo (field hockey), versus VentMG and MixMG (basketball, handball) after the physical agility test and game concerning individual symptoms in wearing

Symptoms in wearing for the MG types	Distribution of responses (n; valid %)					Mean value	N Total
	1 Not (at all)	2	3	4	5 Extremely		
Dry mouth							
MixMG	14 (41.2)	12 (35.3)	8 (23.5)	0	0	1.50±1.19	34
VentMG	17 (43.6)	4 (10.3)	7 (17.9)	10 (25.6)	1 (2.6)	2.00±1.72	39
BBHo	15 (71.4)	1 (4.8)	0	3 (14.3)	2 (9.5)	1.38±1.83	21
Thirst							
MixMG	10 (29.4)	10 (29.4)	8 (23.5)	5 (14.7)	1 (2.9)	2.18±1.36	34
VentMG	8 (20.5)	8 (20.5)	11 (28.2)	9 (23.1)	3 (7.7)	2.69±1.38	39
BBHo	10 (47.6)	3 (14.3)	3 (14.3)	3 (14.3)	2 (9.5)	1.90±1.79	21
Burden							
MixMG	8 (24.2)	11 (33.3)	5 (15.2)	9 (27.3)	0	2.42±1.20	33
VentMG	7 (17.9)	9 (23.1)	13 (33.3)	5 (12.8)	5 (12.8)	2.74±1.35	39
BBHo	7 (43.8)	4 (25)	0	2 (12.5)	3 (18.7)	1.94±2.05	16
Nausea							
MixMG	26 (76.5)	4 (11.7)	2 (5.9)	2 (5.9)	0	0.91±1.19	34
VentMG	29 (74.3)	4 (10.3)	5 (12.8)	1 (2.6)	0	0.85±1.20	39
BBHo	16 (76.2)	1 (4.8)	2 (9.5)	0	2 (9.5)	0.86±1.68	21
Retching							
MixMG	26 (76.5)	3 (8.8)	3 (8.8)	2 (5.9)	0	0.97±1.22	34
VentMG	26 (65)	6 (15)	3 (7.5)	4 (10)	1 (2.5)	1.20±1.39	40
BBHo	17 (81)	0	2 (9.5)	1 (4.8)	1 (4.7)	0.76±1.55	21

Evaluation of individual symptoms due to mouthguard wear (from 0 (not at all) to 5 (extremely); n; %). Abbreviations: MG: Mouthguard, MixMG: Two-component mouthguard, VentMG: Vented Nike adult max intake mouthguard, BBHo: Boil-and-bite mouthguard of field hockey players

Table 5: Evaluation of individual symptoms in VentMG and MixMG wear separately after the physical agility test and game

Parameter	VentMG After physical agility test	MixMG After physical agility test	VentMG After game	MixMG After game
Dry mouth	2.13±1.64	1.29±1.26	2.00±1.79	1.17±1.10
Thirst	2.53±1.33	2.00±1.32	2.69±1.49	2.35±1.41
Burden	2.89±1.37	2.56±1.15	2.55±1.32	2.29±1.26
Nausea	0.75±1.12	0.88±1.27	1.14±1.52	0.94±1.14
Retching	1.00±1.45	0.94±1.14	1.57±1.60	1.00±1.32

Evaluation of individual symptoms by mouthguard (MG) wear (from 0 (not at all) to 5 (extremely)); n; %, p value). Abbreviations: MixMG: Two-component mouthguard, VentMG: Vented Nike adult max intake mouthguard

mouthguard between physical agility test and game in unpaired as well paired (only in handball) testing.

DISCUSSION

In this investigation the acceptance of mouthguards in basketball, handball, and field hockey as well as the frequency of orofacial injuries was checked. We compared the effects of a vented and two-component mouthguard on physical agility in handball and basketball players, who had no mouthguard experience, and the impact of these mouthguards in comparison to the regularly worn boil-and-bite mouthguard of field hockey players on game activity.

Mouthguard Acceptance, Reasons for Use or Rejection

The present study shows a marked cognitive dissonance between the attitudes of players and their reported behavior in mouthguard wear. While all basketball players and 71.4 % of the handball players acknowledged the value of mouthguard in injury prevention, only one basketball player used a mouthguard after previous tooth fracture, and no one from the handball group.

82.6 % (n= 19) of the field hockey players (78.3 %; n= 18) used a boil-and-bite mouthguard and 1 female field hockey player an individually fitted mouthguard for protective reasons (85.7 %), and 14.3 % because of other player's behavior. There was active encouragement and promotion by the hockey club to use boil-and-bite mouthguards regularly. The selection of the mouthguards used and provided in the hockey club may be influenced by limited knowledge of the attributes and low cost of this mouthguard (~5.95 €). Because of the regular replacement, particularly in adolescents, the low cost may be relevant, and a professionally fitted mouthguard may be a too high financial barrier. The

characteristics of different types of mouthguards may not be well understood by team members or coaches, who were the most frequent source of advice (66.6 %) after family and friends (29.2 %). The mouthguard use in field hockey was the result of the education and motivation of players, parents, coaches, and officials, supplementing the information to players. A most relevant role of coaches for mouthguard use has been described (17). In contrast Cornwell et al. (16) found that club and coach (18 %) played a less relevant role for mouthguard use vs. friends and family (49 %), especially in young athletes, followed by dentists (29 %).

In the basketball and handball teams, the active encouragement and promotion of mouthguard use by coaches or clubs was found to be very low, and this is in line with Berg (1998) and Collins (2015) (18, 19). The latter reported that coaches (87.3 %) or parents (64.5 %) had never recommended the use of a mouthguard.

In our present study almost all handball and basketball players wore no mouthguard. The most frequent reason was "never thought about this" (31 % in basketball, 27 % in handball), followed by "speaking and breathing interference" (23 % respectively 27 %). 7.6 % of basketball and a double percentage of handball players answered that they did not feel at high risk for dental injuries. The fact that the most frequent reason was "hadn't thought about it" is important for dentists, coaches, clubs and family members, and highlights the lack of encouragement and promotion by the dental profession and player's organizations.

Collins et al. (19) examined the behavior, attitude, and current mouthguard use in basketball and softball athletes in 21 High Schools. The most frequent reasons for not wearing a mouthguard were "not necessary" (65.3 %), and "speaking and breathing interference" (61.5 %). Cornwell et al. (16) found that basketball

players with previous injuries were 2.76 times more likely to use a mouthguard than those without previous injury. In our study only one basketball player always wore a mouthguard after sustained a tooth fracture, while the other basketball players had soft tissue injuries (n= 4) and a mandible luxation (n= 1) and used no mouthguard. In handball 12.5 % of the players had a tooth and 6.3 % a jaw fracture, but no behavioral change occurred and no one actually wore a mouthguard. The use of a mouthguard may prevent or attenuate dental and oral injuries. Despite their positive effects, mouthguards are rarely used. Obviously also former accidents had no relevant effect on the willingness to use mouthguards. This shows that new motivating tools must be developed to improve the acceptance for mouthguards in the future.

In basketball 50 % and in handball 14.3 % believed that mouthguards are necessary in games, and no one, except the only basketball player with an individual mouthguard, thought that mouthguards are necessary in training sessions. Collins et al. (19) found in a total of 1.636 basketball and softball athletes (12.3 %) who permanently or occasionally wore a mouthguard during training periods or competitions. The Australian intervention study of Cornwell (16) reported about the use of mouthguards in basketball. A total of 496 basketball players answered two questionnaires (baseline and follow-up). Players were youths (n= 208, 12-15-year olds) and adults (n= 288, 18 years and over) from all levels (social to elite). Completion of the baseline questionnaire was followed immediately by an intervention, comprising written and verbal informations about mouthguard wear and construction. Only 25 % (n= 125) used a mouthguard. The mouthguard wear was less frequent in training (25 %) than in the games (62 %). Despite the twelve-week intervention, the use of a mouthguard in young athletes did not increase, among adults by only 14 % for training and 10 % in the games.

In contrast we found in field hockey that 81.8 % of the players believed that mouthguards are necessary in games and (68.2 %) in training sessions. Accordingly 84.2 % always wore a boil-and-bite mouthguard in the games. In contrast only 50 % of the players who rated the mouthguard as necessary in the training wore a mouthguard in the training sessions. This demonstrates a marked cognitive dissonance between the attitudes of players and their reported behavior for the mouthguard use in training. In practice the training

situation was assessed to have a lower importance and comfort restrictions were superior: As reasons for not always wearing a mouthguard were given speaking and breathing interferences (52.8 %), uncomfortable wear (16.7 %), “never thought about it” (14 %), no high risk for dental injury (8.3 %), and “friends also don’t wear” (5.6 %).

The data on sports-related dentofacial injuries illustrate the need of mouthguard use in sports. It has been found that the incidence of injuries in handball is at approximately 13.5 per 1.000 hours athletic exposures (20). In contrast, the incidence of injuries in training was 0.6 to 2.6 per 1.000 hours. In basketball a range of 9 injuries per 1.000 competitions and in the training a range of 4 per 1.000 athletic exposures have been reported. Dental injuries occurred surprisingly often (21). According to an American study ((NCAA) at hockey players an injury rate of 6.3 per 1.000 athletic exposures accounted in training and competitions (22). These studies agreed that at higher leagues the number of injuries increased, as well as in training fewer injuries than in the competition occurred.

In a study by Collins et al. (19), the distribution of dental injuries was described in high school athletes between the years 2008 to 2014. Most dental injuries of the girls occurred in field hockey (3.9 % of all injuries) and of the boys in basketball (2.6 %). The injury rate in the training sessions was three times lower than in competitions. The most frequent causes of injuries were a blow from another player (61.3 %), and from the equipment (31.5 %). In 72.5 % of cases with a dental injury, the player wore no mouthguard. In case of mouthguard use in 96 % a “boil-and-bite” mouthguard was used, which is in line with our study concerning the field hockey players.

Frequency of Orofacial Injuries

From 23 field hockey players, 19 (82.6 %) were wearing a mouthguard at the time of the injury while 3 lip/cheek lacerations and 2 concussions occurred, but no dentofacial injuries. Since a greater force is needed to produce dento-alveolar injuries in the presence of a mouthguard, it is speculated that some of these injuries were lessened or further injuries were prevented by the mouthguard. 4 field hockey players wore no mouthguard and 3 of them sustained concussion and orofacial lacerations. In total 70.8 % (n= 17) had no previous orofacial injuries.

In the handball group (n = 14) 50 % had orofacial injuries, 18.7 % sustained soft tissue lacerations, followed by 12.5 % with concussion, 12.5 % with tooth fracture and 6.3 % with jaw fracture (n = 18.8 % orofacial injuries). One study in Turkish elite handball athletes (23) found a slightly higher percentage (26 %) of the handball athletes who experienced at least one type of dental injury, and no one wore a mouthguard. Another study (24) at paediatric handball players (mean age 12 ± 1.6 years) in Turkey showed also in the range of 19 % dental injuries, while no player used a mouthguard. The risk of injuries in handball is extremely high due to the dynamic and powerful stressed game character. Fast and strong-stretching movements with many changes of the direction and frequent opponent contacts make the game attractive and exciting for the spectators. Due to direct and partly hard contacts with the opponents a relevant risk of traumatic injuries is always present. In particular aggressive behavior with pushing and pulling while attacking an opponent may cause many injury cases. Throws at the goal which are influenced by external conditions can miss their target from time to time and cause serious injuries to the head and face.

In the basketball group of our study 62.5 % (n= 5) had orofacial injuries, suffered soft tissue lacerations (n= 4), and dental injuries (n= 3).

Basketball is a high impact sport with high prevalence of orofacial trauma, particularly maxillary central incisor and lip injuries, but athletes did not use mouthguards.

Orofacial injuries in basketball are frequent. Approximately 10 % of all injuries in basketball involve the head, neck, or orofacial area (25). A prospective study at Minnesota high school basketball athletes reported a high proportion of orofacial injuries (55.4 % of the players per playing year), and a study at 1020 high school varsity basketball players in the US recorded 30.9 % injured players (26, 27). The distribution of injuries included: Lacerations, 49.9 %; facial bruising, 15.8 %; loosening of teeth, 10.9 %; jaw stiffness, 10.3 %; numbness, 5.7 %; and fracture; 0.2 % (26). Excluding Rugby Union, a New Zealand study found basketball to be the third highest contributor to dental injuries compared with the top 10 sports (28). A study of 246 schoolboys in Singapore ranked basketball with the third highest prevalence of dental injury (29).

A study of the Brazilian National Basketball players (30) showed in 50 % orofacial injuries, dental trauma

accounted for 69.7 %, with emphasis on maxillary central incisors, followed by soft tissue (60.8 %, mostly lip injuries). Only 1 % wore a mouthguard at the time of trauma.

Knobloch et al. (31) studied in school sports (School Year 1996/97, Germany) the distribution of injuries in different sports as well as the location of the injury. There were 2.234 violations registered of which 73 were related to the mouth and jaw area, which accounted for 3.3% of total injuries (in total, there were found in basketball 431 injuries, in handball 110, and in hockey 65). From these 73 orofacial injuries 51 affected the teeth (2.3 %). Related to the sports from these were found 7 tooth injuries in basketball, 1 in handball and 6 in hockey. In hockey, the dental injury rate of 9.2 % from the total was the third largest after bruises (n= 31; 47 %) and lacerations (n= 7; 10 %). In hockey 30.8 % of all injuries occurred in the head region, and mostly caused by a blow from the ball or stick (61.5 %).

In our study 58 % of all participants without mouthguard use had orofacial injuries, mostly soft tissue lacerations (59.6 %), followed by concussion (27 %), tooth fracture and loss (26.6 %), jaw fracture (6.6 %), and mandible luxation (6.6 %).

In contrast to many other body tissues, most dental tissues have a low potential for recovery, when damaged. A dental crown fracture is irreversible. Even a minor injury like a concussion can cause pulp necrosis. More severe injuries such as dislocations or avulsions may result in the loss of the tooth due to ankylosis or infection-related root-resorption (32). An injured tooth often requires extensive treatment just to become functional again and can create a lifetime of expensive, long-term problems for the athlete (33-35). For these reasons, the wear of a mouthguard is recommended. In terms of the high rate of orofacial injuries shown in this study the use of a mouthguard is necessary and can have a relevant preventive value.

Comfort

Player perception of the mouthguard is important as this largely determines the compliance and enthusiasm (6). The mouthguard should be comfortable, retentive, allow normal breathing and speech, and should not impinge on the soft tissues (36). Stock mouthguards are inexpensive, and are ready for immediate use. They are often ill-fitting and many strongly interfere with

breathing and speech because they must be held in position by keeping the teeth together.

Mouth formed mouthguards are a compromise between stock and custom made, and inexpensive. The most popular is the boil-and-bite mouthguard type. Often it is made of a thermoplastic material, usually EVA copolymer. It is softened by boiling water and adapted intraorally while warm by biting into the material. Another version comes with a shell, usually of ethylene vinyl chloride. Mouth-formed mouthguards fit better than stock mouthguards.

Custom made mouthguards are fabricated indirectly on a stone model from a dental impression, usually alginate. These mouthguards are the most expensive but are superior in many aspects. A custom-made mouthguard has the superior comfort, breathing, fit, speech, protection, and performance. The costs after sports-related alveolar and dental injuries in mixed dentition are much higher than the repeated manufacture of individual mouthguards e.g., due to growing jawbones in children. To make mouthguards more attractive, they can be offered in different colours.

Problems associated with breathing, speaking, and comfort are unlikely to influence mouthguard selection unless the player has used one previously. Only one player in our study basketball group used an individually fitted mouthguard. The handball players used no mouthguard before.

Subjects using mouthguards consistently indicated that their breathing and speaking is impaired and they are uncomfortable (37). Other studies have cited discomfort and poor fit as common concerns (38, 39).

The results of this study support this conclusion, and mostly no perceptual significant differences were reported between the vented and two-component mouthguard evaluated from the handball and basketball players concerning comfort and subjective impressions. The interference of speaking was rated worse, and the impact on speech was classified significantly worse for the vented mouthguard ($p < 0.005$). This may be due to the breathing channels which may impair the lips and tongue. No differences were seen between the agility testing and game condition. The handball and basketball players with one exception in each group had no previous experience in wearing a mouthguard during sport activity; however, it is possible that regular

or everyday use of a mouthguard could influence these perceptions.

The field hockey players wore their cheap boil-and-bite mouthguard mostly regularly during sport activity, and had much experience in this mouthguard model. We also compared the ratings of the experienced field hockey players to those of the basketball and handball players. The interference in speech with the two-component mouthguard was characterized as significantly less, when compared to the boil-and-bite mouthguard of the field hockey group ($p < 0.003$) and the vented mouthguard ($p < 0.005$). The two-component mouthguard may have a minor impact on speech because the soft mass adapted perfectly to the contour of each tooth, hardened in the mouth and got individualized. No significant differences were seen in the categories of fitting, stability on running, comfort, and breathing, classified in an average of 5 to 7 from 10. Interference with speech and drinking was rated the worst. The field hockey players regularly used a mouthguard during sport activity, but the regular use of the mouthguard resulted in no difference in the perceptions nor had a great influence when compared to the handball and basketball players who were unexperienced in mouthguard wear. The field hockey players rated the drinking ability of their mouthguard worse than the handball and basketball players. The individual symptoms in wearing (thirst, dryness, burden, nausea, and retching) rated in a scale from 0 (not at all) to 5 (extremely) resulted in categorizations between 1.5 to 2.5, and showed no significant differences between the sports groups.

Mouthguards can cause discomfort when placed in the oral cavity, in particular due to their thickness of the labial and palatal region to reduce the impact force of an injury. The mouthguard must dampen vibrations and be rigid enough to distribute the power. A good mouthguard combines the positive characteristics such as high protection, secure grip, long life, easy handling and purification, and above all it has not to affect the performance, breathing and speaking of the athlete. In Germany a study by "Stiftung Warentest" about different mouthguard types showed that the commercially available simple mouthguard, although it was the most cost effective solution (with 5 to 10 €), was classified as "unsuitable" (in the categories of fitting, mouth breathing, speaking, protection and acceptance). The variant "boil-and-bite" (between 5 and 40 €) was in all points of investigation classified

as “less suitable”. The price of the two-component mouthguard (25 to 40 €) was similar to the boil-and-bite mouthguard, but “suitable” in 4 of 5 estimated study points, only the point “protection” was classified as “less suitable” as for the boil-and-bite mouthguard. Only the custom-made mouthguard, from dentists or orthodontists prepared, and with 100 to 200 € a more expensive version, was rated in the test as “very useful” (fit, support, and acceptance) or classified “suitable”.

In our present study, we tested a boil-and-bite and the two-component mouthguard as a possible alternative to an expensive individual mouthguard and found only the speaking ability as significantly better in the two-component mouthguard.

The subjects` perceptions of the mouthguard is important as this largely determines their attitudes and behaviors. The individual ratings of the field hockey players who wore a cheap boil-and-bite mouthguard, did not significantly differ from those of the handball and basketball players. The mentioned discomfort and interferences could not affect their acceptance of their boil-and-bite mouthguard and its regular wear in field hockey games. This may be influenced by the coach and family members, who forced the mouthguard use as an ultimate influence. Despite all possible and obvious disadvantages, the use of a cheap boil-and-bite mouthguard was in the most field hockey players a tightly integrated behavior in their sports activity. Two female players reported that the wearing is a purely mental issue, because they feel uncomfortable in the game without their mouthguard.

This in summary demonstrates, that education, information, strict instructions, and the assistance of club, coach, family and friends can obviously integrate a desired behavior (mouthguard wear) into daily sports, despite possible restrictions.

CONCLUSIONS

The acceptance and use of mouthguards must be markedly intensified in handball and basketball. Although all basketball players and 71.4 % of the handball players acknowledged the protective value of mouthguards, the most frequent reason for not wearing a mouthguard was “never thought about this”. In field hockey the use of mouthguards was common. 82.6 % acknowledged the protective value of the mouthguard. Its consequent use during the field

hockey games was highly influenced by the education and motivation of players through parents and coaches. Health professionals themselves, including dentists, should be well informed about the sport specific value of mouthguards. This is crucial to increase mouthguard use in ball sports. Educational programs, media promotion and vertical dissemination of information within basketball and handball organizations could also be effective. Further investigations of dental injuries in hand- and basketball would be valuable in order to provide players, coaches, parents and sporting federations with the necessary information to make decisions regarding the use of mouthguards. Mouthguard use should be made compulsory, especially in these sports with high risk for dental injuries.

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