Educational intervention among football players to prevent muscular-skeletal injuries

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Summary

Introduction: Health education based on interventions with new information and communication technologies are increasingly used in primary prevention. Physiotherapy in the field of sport has demonstrated in recent years scopes of evidence-based practice since its interventions from the field of public health, therapeutic clinical in the scheme of integral rehabilitation.
Aim: To compare the effectiveness of an educational physiotherapy intervention in soccer players, in face-to-face mode (conference) versus an intervention mediated by the technologies of the information and communication [TIC], on the risk of injury measured with the Functional Movement Screen [FMS].
Material and method: A randomized clinical trial (RCT) was carried out. The population consisted of 100 participants divided into two groups (TIC n = 50) and (Conference n = 50), with an average age of 18.2 vs 18.3 years for a conference and TIC respectively.
For the collection of information, an evaluation questionnaire for self-completion was developed based on the considerations of the sports science team (sports specialist, physiotherapists, nutritionists, sports biomechanics, sports trainers, sports professional) of the club sports. A total of 17 question-type items were distributed in seven categories of knowledge about injury prevention, which should be addressed by the health education plan from Physiotherapy.
Results: A T test was performed for the FMS score applied in relation to the conference group vs. TIC, a bilateral significance was found p <0.001, which concluded that the TIC methodology in relation to the increase in the score in the average FMS after the intervention was higher in the methodology that implemented TIC.
Conclusions: An educational intervention in physiotherapy based on Information and Communication Technologies is more effective than a conference intervention (in person) to increase the score in the knowledge questionnaire for the prevention of sports injuries in football.

Key words:
Physical activity. Physical therapy specialty. Public health. Soccer (MeSH).

Intervención educativa en futbolistas para la prevención de lesiones músculo esqueléticas

Resumen

Antecedentes: La educación en salud basada en intervenciones con nuevas tecnologías de la información y comunicación [TIC] son cada vez más utilizadas en la prevención primaria. La fisioterapia en el ámbito del deporte ha demostrado en los últimos años alcances de práctica basada en la evidencia desde sus intervenciones desde ámbito de la salud pública, clínico terapéutico en el esquema de la rehabilitación integral.
Objetivo: Comparar la eficacia de una intervención educativa de Fisioterapia en futbolistas, en modalidad presencial (conferencia) frente a una intervención mediada por las tecnologías de la información y comunicación [TIC], sobre el riesgo de lesión medido con el *Functional Movement Screen* [FMS].
Material y método: Se realizó un ensayo clínico aleatorio [ECA] la población estuvo conformada por 100 participantes distribuidos en dos grupos (TIC n=50) y (Conferencia n=50), con un promedio de edad de 18,2 vs 18,3 años para conferencia y TIC respectivamente. Para la recolección de la información se construyó un cuestionario de evaluación para auto diligenciamiento elaborado a partir de las consideraciones del equipo de ciencias del deporte (médico especialista en deporte, fisioterapeutas, nutricionistas, biomecánico del deporte, entrenadores deportivos, profesional del deporte) del club deportivo. Se establecieron un total de 17 ítems tipo preguntas distribuidas en siete categorías de conocimientos sobre la prevención de lesiones, que debía de abordar el plan de educación para la salud desde Fisioterapia.
Resultados: Al realizarse la prueba de T para puntaje de FMS aplicado en relación al grupo de conferencia vs TIC se encontró una significancia bilateral p< 0,001 donde concluye que efectivamente la metodología TIC en relación al aumento de la puntuación en el FMS promedio tras la intervención fue mayor en la metodología que implementó las TIC.
Conclusión: Una intervención educativa en fisioterapia basada en las Tecnologías de Información y Comunicación es más eficaz que una intervención en conferencia (presencial) para aumentar la puntuación en el cuestionario de conocimientos para la prevención de lesiones deportivas en el fútbol.

Palabras clave:
Actividad física. Especialidad de terapia física. Salud pública. Fútbol (DeCS).

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Introduction

The model for researching sporting injury prevention follows a conceptual process described by Van Mechelen[1]. There are four steps to this model: 1. Establish the injury rate, 2. Establish the injury prevention mechanism, 3. The design and implementation of the interventions, and finally, 4. Re-assessment of the injury rate.

In practice, a large group of athletes or teams are chosen randomly, or a control group or intervention group, and the injuries obtained over a complete season are registered.

In the 1980s, Ekstrand *et al*.,[2-4] published the results of the first injury prevention trials in professional football. Yet it was not until the mid to late 90s when the prevention trials were implemented on a broad scale. There were two types of trials: trials to prevent a specific injury, and those designed to prevent a larger spectrum of injuries. Ankle sprain has been one of the most common injuries in this sport; several studies have been published with the aim of reducing the frequency rate of this pathology in the sporting field[5-15]. The aim of other projects has been to prevent other common injuries, such as tendon injury[16], stretched hamstrings[17-21], stretched groin[22,23], and knee strains - in particular the anterior cruciate ligament[24-30] - without reaching the health education of the participants of injury prevention programmes in sport.

Material and method

A study was performed on two random clinical trial groups [RCT] to assess the effectiveness of educational intervention of Physiotherapy in person (conference) compared to an educational intervention via Information and Communication Technologies [ICT] in increasing knowledge about muscular-skeletal injuries obtained whilst playing football within a primary injury prevention programme in physiotherapy.

This project was registered in the Clinical Trials Registrar (https://clinicaltrials.gov/)[31].

Sample

Players from the sub-20 group of athletes from the professional football league team that fulfilled the criteria of being professional-league athletes aged over 18 years with a sporting career of over three years, with an examination of physical condition performed by the interdisciplinary team prior to entry, or at the start of the sporting club membership, resident in Bogotá or municipalities of Cundinamarca. All the participants took part voluntarily and signed an informed consent form, complying with the ethical rules of the Research Committee and the Helsinki Declaration.

Instruments or scales used

To gather the information a self-administrated assessment questionnaire was built, created from the considerations of the sports science team (specialist sports doctors, physiotherapists, nutritionists, sports biomechanics, sports trainers, sporting professionals) from the sports club. A total of 17 question-type items were established, split into seven knowledge categories about injury prevention, which should address the education plan for health from Physiotherapy. The score was calculated as follows: each question answered correctly with the YES or NO option earned a point, the correctly answered questions were added up, and divided by the total number of questions. To calculate the score a rule of three was used, transforming the score into a scale of 0 to 100.

In order to validate the data gathered from the questionnaire, a pilot test was performed with 20 subjects, who completed the questionnaire, and from the opinions of these subjects, adjustments were made to the questionnaire before applying it to the study subjects. Furthermore, before the start of the study and with the aim of obtaining better quality information from the questionnaire, the instrument was subject to a content validation process by 10 experts in the area of physiotherapy, physical activity or sport, all with the minimum level of training of a master, doctorate or post doctorate recognised in the field of sports science. Next, to establish reliability and internal consistency, the Cronbach Alfa statistic was applied, with a result of 0.80.

The questionnaire was applied at two points in time, with three blinded physiotherapists assessing the study intervention, who interacted before the start of the educational programme and at the end, to provide comparative information in terms of levels of knowledge about sporting injury prevention in football players. To assess the risk of injury, the Functional Movement Screen battery of tests was used. The study group was assigned using a table of random numbers, using the Microsoft Excel 2010© programme. A document was created with the randomisation keys, in which the numeric codes were ordered from lowest to highest, and opposite was the group corresponding to the previously performed random allocation.

Statistical analysis

The data collected was analysed using the statistics package SPSS by IBM© Version 19 [Chicago, USA]. The analysis plan was performed considering the objectives of the RCT. It was considered that the data followed normal distribution, given that the sample was greater than 30. The descriptive statistic for quantitative variables displays the average and standard deviation, with their respective confidence intervals of 95% [CI95%], and absolute and relative frequencies for qualitative variables.

Results

The study population comprised 100 participants distributed into two groups (ICT n=50 and Conference n=50), with an average age of 18.24 vs. 18.34 years for conference and ICT respectively; for the "sporting age" variable, the average was 110.1 vs. 106.8 sporting months for conference and ICT respectively; upon applying the test to establish the

Table 1. Comparison of quantitative variables against the intervention groups.

Variable		Average	S.D	CI 95% for Difference		P Value*
Age (years)	Conference	18.2	0.5	-0.3	0.1	0.3
	ICT	18.3	0.5			
Sporting age (months)	Conference	110.1	21.0	-2.5	9.3	0.2
	ICT	106.8	10.3			

*t test for significant independent samples (<0.05); ICT: Information and communication technologies.
Source: Own creation.

Table 2. Cronbach alpha statistic as intervention instrument in education.

Cronbach alpha*	No. of elements	Cases
0.9	14	20

*> 0.8 (Minimum recommended level of Reliability).
Source: Own creation.

difference of the two groups, the T statistic was applied, revealing that no statistically significant differences were found in any of the comparisons (P value = 0.37 Age and 0.25 sporting age) (Table 1).

With regards to the content validation of the general knowledge about sporting injuries instrument, 0.8 was obtained, which was therefore applied in terms of football sports injury prevention.

In terms of the reliability analysis using the internal consistency measurement, it was applied to 20 people per item, revealing a global Cronbach of 0.9+ (Table 2).

T test to compare the ICT and conference groups in terms of knowledge scores

At the start of the study the conference group obtained an average of 20.7 points compared to 26.1 points obtained by the ICT group, whilst after the intervention the conference group obtained 40.8 points and the ICT group 74.8 (Table 3).

In a graphic representation of the two measurement times, it can be descriptively appreciated how the change took place more markedly in the ICT-led group (Figure 1).

The hypothesis that the average scores obtained with the ICT were greater than those obtained by conference methodology scores was checked. To check this hypothesis, a T-test was developed, which compared the results obtained after the interventions (single tail T-test, bilateral significance of 0.05, alpha 10, so that each tail was 0.05 and a confidence level of 95% to contrast the null hypothesis). The Levene test was checked first, and it was verified that Homoscedasticity assumption was fulfilled (P=0 22). Normality was not verified, as sufficiently large samples were present (n>30) to assume this.

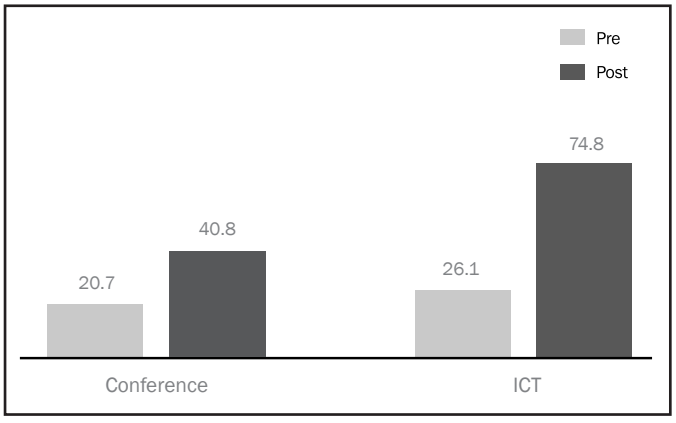
The table revealed a bilateral significance with a p value of <0,001, meaning the null hypothesis was rejected and it can be concluded that effectively, the average performance was greater among those following the ICT methodology (Table 4).

Table 3. Descriptive statistics for initial and final score divided by intervention group.

Score	Type of Intervention	No.	Average	S.D
Initial	Conference	50	20.7	11.8
	ICT	50	26.1	9.8
Final	Conference	50	40.8	13.7
	ICT	50	74.8	17.7

ICT: Information and communication technologies.
Source: Own creation.

Figure 1. Scoring obtained at two points of intervention: conference (in person) vs. ICT.



T-test to compare the application of FMS in ICT and conference groups

The descriptive statistics of the FMS battery test scores reveal an initial score of 8.8 points for the conference group, and 8.1 points for the ICT group. In terms of data following the intervention, the conference group revealed an average score of 14.0 points and the ICT group 17.4 (Table 5).

To check the statistical significance of this result, a comparison test was performed of averages. The hypothesis that the average scores obtained with the ICT for the battery of FMS tests were greater than those obtained by conference methodology scores was checked. To test out this hypothesis, a t-test was developed, which compared the results obtained after the interventions. The Levene test was checked first, and it was verified that Homoscedasticity assumption was not fulfilled

Table 4. Summary of T test for Final Conference Score vs. ICT.

Independent samples test								
Model T test		Levene test for equality of variance		T test for equality of averages				
		F	Sig	t	P value	Mean difference	90% confidence interval for the difference	
							Inferior	Superior
Initial score	Equal variances have been assumed	0.5	0.4	-2.4	0.01	-5.41	-9.0	-1.7
Final score	Equal variances have been assumed	1.5	0.2	-10.6	0.00	-34.00	-39.2	-28.7

Source: Own creation.

Table 5. Descriptive statistics for initial and final FSM divided by intervention group.

Score	Type of Intervention	No.	Average	S.D
Initial	Conference	50	8.8	1.3
	ICT	50	8.1	1.1
Final	Conference	50	14.0	2.7
	ICT	50	17.4	1.2

ICT: Information and communication technologies.
Source: Own creation.

(P< 0.01). Normality was not verified, as sufficiently large samples were present (n>30) to assume this.

For the average comparison test, a unilateral confidence level of 95% was taken (bilateral significance of 90%) to contrast with the null hypothesis:

$$H_0 \text{ FSM: } \mu_{Tics} < \mu c_{onferences}$$
$$H_1 \text{ FSM: } \mu_{Tics} > \mu c_{onferences}$$

The table reveals bilateral significance p<0.001, which means that the null hypothesis is rejected and it can be concluded that effectively,

Table 6. Summary of t-test for FMS score applied in relation to the Conference vs. ICT group.

Independent samples test								
Model T test		Levene test for equality of variances		T test for equality of averages				
		F	Sig	t	P value	Mean difference	90% confidence interval for the difference	
							Inferior	Superior
FMS (pre)	Equal variances have been assumed	0.4	0.4	2.5	0.0	0.6	0.2	1.0
	Equal variances have not been assumed			2.5	0.0	0.6	0.2	1.0
FMS (post)	Equal variances have been assumed	20.6	0.0	-8.0	0.0	-3.3	-4.0	-2.6
	Equal variances have not been assumed			20.6	0.0	-8.0	0.0	-3.3

Source: Own creation.

the development of the ICT methodology in connection with the increased score in the average FMS following intervention, was greater in the methodology that implemented ICT, despite the difference between the groups in the pre-interventions values in favour of the conference group (Table 6).

Discussion

The results reveal that educational physiotherapy intervention via ICT is more effective at increasing knowledge about muscular-skeletal injuries in footballers than in-person interventions.

These results follow the same line of previous studies that use ICT to education diverse populations. Blachard *et al*.[32] relate how young students revealed a higher level of attendance to health promotion programmes given through ICT, and that these programmes favour accessibility in health education issues. King *et al*.[33] used ICTs to teach a group of Physiotherapy students about sporting injury prevention (10 males, 16 females, average age = 22.4 ± 3.6 years). The researchers compared two groups: CD-ROM (n = 15) and conference (n= 11) and they analysed attitudes towards computer-assisted instruction and the use of the CD-ROM programme. Upon reviewing the results of the research, significant differences were found (p = 0.05) between the groups in the scores obtained by students, both in written and practical assessments, in the advantage of the CD-ROM group. Zaremohzzabieh *et al*[34] indicate that young people use ICTs as an integral part of their daily life. On the other hand, Moulin *et al.*[35] performed a study about the impact of information and communication technologies on hospital administration and user handling, concluding that they facilitate the implementation of innovation practices that aim to provide a high level of quality and that promote effective on-going education.

With regards to the FMS result as a predictor of sporting injury risk among footballers, and the relationship with the knowledge questionnaire, our ICT study group revealed a significantly greater improvement in FMS score (14.0 vs. 17.4 points), along with a higher score in injury prevention knowledge compared to the conference group (in-person). Only the ICT group (17.4 ± 1.2 points), managed to surpass the threshold of 14 points in the FMS, indicating how the point below this holds an increased risk of injury[36], revealing that the most effective intervention for reducing this risk is that of the ICT.

These results are aligned with that indicated in the literature, as the relationship between self-knowledge and sporting injury rate on the playing field can be seen[37].

Doyscher *et al*.[38] consider that the FMS test presents moderate reliability. Under ideal circumstances, the test data distribution would be normal, and the total FMS score would be stable. However, an important prerequisite for these conclusions would be the normal distribution of data and a clear factorial structure, which would indicate an underlying construct. Possible causes that explain the decrease[39-41]. It was discovered that the greater the assessment experience of assessors, the higher the objectivity and reliability compared to inexpert assessors. In our study the assessors had both training and experience in using this series of tests. However, a systematic review with meta-analysis from 2017, which reviewed 24 publications and that applied this assessment tool, reported moderate evidence to recommend it as a test to predict injuries in football, and for other demographics (including American football, university sports, basketball, ice hockey, running, the police and fire-fighters), the evidence was limited or conflictive[42].

The questionnaire about knowledge to prevent sporting injuries among footballers, obtained a validity index of general content of 0.8, revealing it to be a valid instrument in exploring knowledge about preventing sporting injuries in football. In terms of the reliability analysis using the internal consistency measurement, it was applied to 20 people per item, revealing a global Cronbach of 0.9. This value is somewhat higher than that obtained from the validation of a psychological characteristics questionnaire linked to sporting performance of 40 items organised into five sub-scales with a Cronbach Alfa co-efficient of 0.8[43].

Conclusion

Education physiotherapy intervention based on Information and Communication Technologies is more efficient than a conference intervention (in person) in increasing scores in the knowledge questionnaire for preventing sporting injuries in football.

Education physiotherapy intervention based on Information and Communication Technologies is more efficient than a conference intervention (in person) in reducing the risk of injury via the battery of tests Functional Movement Screen.

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Conflict of interest

The authors claim to have no conflict of interest whatsoever.

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