Visual pereception and verbal answer analysis about general and specific sports contents of CCAFYD´s students

Análisis de la percepción visual y respuesta verbal sobre contenidos deportivos generales y específicos de los estudiantes de CCAFYD

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Abstract

Future PE teachers in their degree receive balanced formation regarding the different branches of knowledge covering Physicall Education and Sports. The objective of this study was to analize the capacity of CCAFYD students to evaluate general aspects of sports,concrete aspects of a given sport, and the criteria in which they are based on. In this study 25 CCAFYD students participated. All of them have evalued the correction or mistakes of 6 executions of strenght exercises at the gym, and 9 concrete technical movements from indoor football. To analyze what the evaluation of each subject was based on, we used eye tracker technology, through which we registered the searching pattern in every single image. The results showed that students receive more general kind of formation, given that verbal and visual valorations were better on this kind of image, and also, that there were less difference between factors involved in the searching patterns to analyze. Once we have analized the variables, we conclude that students have on sports aspects, a general formation.

Key Words: Physical education; eye-tracker; technique.

Resumen

Los futuros profesores de Educación Física, en su titulación de grado, reciben una formación equilibrada en cuanto a las distintas ramas de conocimiento que abarca la actividad física y el deporte. El objetivo de este estudio ha sido analizar la capacidad que tienen los estudiantes de CCAFYD para evaluar aspectos deportivos generales y aspectos concretos de un deporte determinado, así como los criterios en los que se basan. En este estudio han participado 25 estudiantes del Grado en CCAFYD. Todos ellos han valorado la corrección o incorrección de 6 ejecuciones de ejercicios de fuerza en gimnasio y 9 gestos técnicos de fútbol sala. Para analizar en qué se basó la evaluación cada sujeto, se ha utilizado la tecnología eye tracker a través de la cual hemos registrado los patrones de búsqueda en cada imagen. Los resultados nos mostraron que los estudiantes reciben un tipo de formación más general, puesto que las valoraciones verbales y visuales son mejores en las imágenes de este tipo, y que apenas existen diferencias entre las variables implicadas en los patrones de búsqueda para su análisis. Tras analizar las variables, concluimos que los estudiantes tienen una formación en aspectos deportivos de tipo general.

Palabras clave: Educación Física; seguimiento ocular; técnica**.**

Introduction

Contemporary society, makes the sport system a complex structure, which requires a specific formation for all its professionals in order to produce labor success regardless the working field. Therefore, a proposal of the Decree Title is justified, in which the contents balance out the knowledge regarding all branches.

If we analyze the educative area, it has to be said that Physicall Education is a tool to achieve the correct motor development of the student, and also, to make easier the adherence of teenagers to the sport practice (Gutiérrez, Ruiz y López, 2011). Its quality depends on the educative permormance of the teacher, (Baena, Granero y Ruíz, 2010), and therefore, on his or her formation. Regarding this thesis, it is considered really interesting the study of the formative nature of CCAFYD Degree students. It seems essential for future teachers to acquire a general formation about everything which has to do with physicall activity and sports, but it is also important to know specific contents of every single sport in order to be

able to transmit them to the students. That is why in this research, the nature of this formation is analized. We try to find out if general sportive formation is appropriate and also, if it is enough extensive and/or specific, in order to let them learn about technical requirements of a concrete sport.

There is an extensive bibliography related o Physicall Education, but none of the found researches follows our topic or uses our method. Regarding the most recurring topics, the highlighted ones are those about motivational environment, attitude and concerns of the students, because it is necessary to investigate the factors which may influence their motivation (González, Sicilia y Moreno, 2011). These ones show that the interest of the students regarding the subject decrease as they pass the year (Moreno, Rodríguez y Guitiérrez, 2003). Other recurrent researching topic is realted to overweight and its relation with PE, and these investigations determined that 30 daily minutes of exercise are enough to reduce this issue (Erfle y Gamble, 2014). Furthermore, topics such as gender equality, equity, and multiculturalism in PE are common, and they are frequently related to hidden curriculum. In respect of teacher's formation in this subject, there are researches which highlight the importance of the continuous formation and investigation as a process to the improvement of the teachers (Castejón, López, Julián y Zaragoza, 2011), (Pedraza y López, 2015)

To carry out this research, eye track technology is used. This concept represent a group of technologies which monitor and record the different areas where the subject pays more attention in an image, and also, the fixings and the visual exploration order followed (Hassan and Herrero, 2007)

This visual recording technique, is a tool which allows us to investigate a lot of areas such as usability, marketing, advertising, medicine or psycholinguistics and also in CCAFYD. Certainly, one of the best researches with this method in this sportive area was Abernethy, who carried out investigations in different sportive disciplines in which he frequently compared novice subjects and expert subjects. One of his most important conclusions was that the differences between this two, were not due to the visual searching strategy by itself, but to the use of the available information. (Vila, García and Contreras, 2012).

From this point, eye track technology, was used on different sportive fields, in which the tendency is to compare between groups of different level of expertise (Vila, Mata, García

and Contreras, 2010). For example, Ripoll (1989) demonstrated that football expert goalkeepers showed restricted fixings to the right part of the body of the player throwing the ball, and their searching strategy, started on the half lower part of the body. Following this author, also in football, video simulations to get to know the decision-making process of referees at a national and international level were used during offside situations (Cattew, Helsen, Gilis, Roie y Wagemans, 2010); or differences regarding visual behavior were tested and the decisions of young players with different levels of exience (Vaeyens, et al 2007). In all of them, the higher the experience is, less fixings and better decision-making.

Using this technique, it was also studied and analized the trap with expert and intermediate level jugglers, (Amazeen, Amazeen and Beek, 2001); the relation between the fixings, expercience, and difficulty of the pool players duty (Williamsm Singer and Frehlich, 2002); the visual search in expert tenis players in a wheelchair (Reina, Moreno and Sanz, 2007); in volleyball, the comparison of visual searching strategies and the reaction time in expert and novice players (Arrollo and Sebastián, 2013); and in taekwondo, the visual behavior differences between the different skill levels (Ruíz, Peñaloza, Rioja and Navia, 2013)

From what we have said until now, this research is carried out with the objective of getting to know the level of general and specific formation in CCAFYD degree in aspects related to training processes and tactical processes of a popular sport.

Material and method

Type of design and sample

This investigation is a descriptive, and transversal study, carried out with a volunteer convenience sample, in wich a pupil tracking was performed over 15 images related with postural/conditional and/or technical/tactical aspects. The sample was composed by 25 students (21 men and 4 women) from de CCAFYD degree, randomly chosen from the Science of Education and Sports of Pontevedra, it was explained to them that their data was going to be used for ths investigation by a informed consent, and always in an anonymous way.

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Table 1.General Characteristics of the sample.

	Men	Women	Total
Age	23,70±3,881	24±2,550	23,76±3.609

Procedure

The procedure to collect data, was the same for all 25 subjects of the sample. For its permormance, a PC with a Windows 8 operating system was used, in which the technology of eye-tracker eye tribe version 0.9.056 was conected by an USB 3.0. It was also used an EyeProof Recorder software, which shows images to study in the computer, and collects, helped by the eye tracker, what the subject of the sample is observing in each moment. The procedure was explained to all the participants before the collection of data was started. The subjects had to be in a comfortable position sitting in a chair in front of the screen and looking at the images through ocular movements. With every subject the ocular tracking device was calibrated to guarantee the correct pupil tracking. To each participant 15 images during 5 seconds each one were showed, time in which they should analyze it and issue an answer according to if they consider rather correct or incorrect the technical execution showed. To know in what was based each subject of the sample to his or her verba valuation, every image showed an interest area determined by the investigators and unknown for the sample. This area is the one which shows us the correct technique execution of the image (Figures 2 and 3). From the 15 images, 6 of them were related to weight lifting technique gestures in order to train strenght at the gym, (a squat, frontal Split, and a bicepts curl) this was called the general block. In all three cases, there was a correct and an incorrect image. The other 9, were related to indoor football technique gestures (specific block). These ones showed: guidance of the ball, pass, shot, a reduction of the goalkeeper space in a cross shape, and a one-on-one defensive action. All of them ,except the last one which was a correct execution, had a correct and an incorrect execution (Figure 4). Each time the subject observed he image and emitted a answer of his or her evaluation, they were written down and immediately transferred. Once the viewing of the images was over, data and statistics obtained referred to the subject were automatically sent to the eye tracker cloud.

Muestra: 25 graduados en CCAFYD
4 mujeres
21 hombres

VISIONADO Y VALORACIÓN DE IMÁGENES
•6 Generales
•9 Específicas

5 segundos /imagen

VARIABLES

ANÁLISIS ESTADÍSTICO
a) Prueba K-S
b) Wilcoxon $p < 0.05$
c) Medidas de tendencia central

V verbal.
V visual.
Fij.
Ord.
T.

MATERIAL
Hardware de seguimiento ocular.
Sofware seguimiento ocular.

Figure 1. Flow diagram

IMÁGENES TRABAJO DE FUERZA EN GIMNASIO	
CORRECTA	INCORRECTA
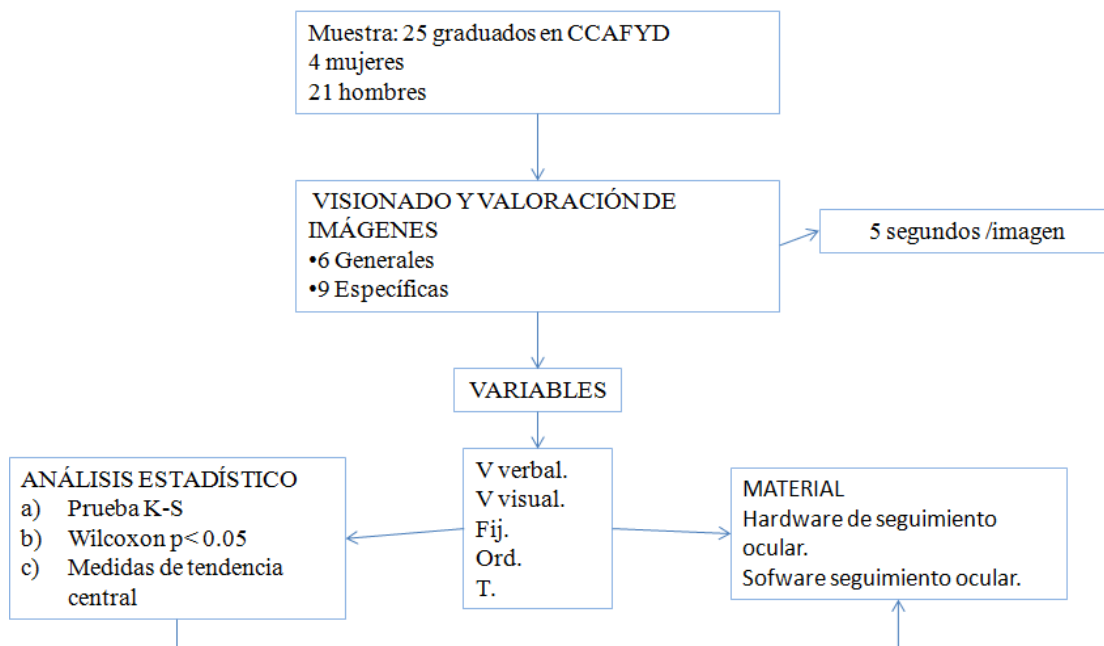
Figure 2. General block imagenes.

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Figure 3.Specific block images.

Variables

From the sample, the following variables were analized

- . Verbal valuation (Verbal V) : It is the subject's estimation of the correct or incorrect technique execution during the image viewing.
- Fixing area or visual valuation (VisualV): Establishes if the subject made a fixing in the interest areas previously established by the investigators on every single image.
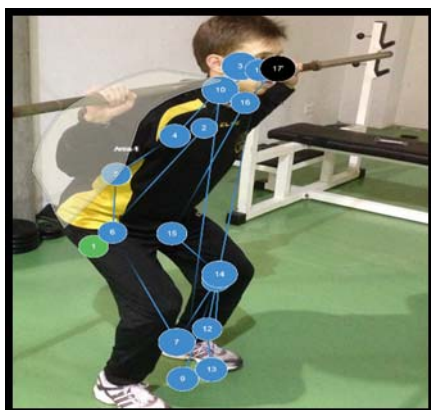

Figure 4. Fixing number and interest area

- Fixings number (Fix): Number of fixings carried out by the subject during the view of the image.

–   First fixing area order (Ord) : ordinal place of the first subject fixing of the predefined area on the image.

–   Moment or time of the first fixing (t): Place that occupies in %, with regard to the whole total numer of fixings, the first fixing on the selected area of each image.

–   Comparison of the verba and visual values, and establishment of a significance <0.05

Statistical Analysis

. First of all, in order to compile data obtained thanks to the eye-tracker, the EyeProof Recorder software was used, and because of this, the numer of fixings and the order and time of the first fixing on the interest area was determined. To organize data in tables as we suit, Microsoft Excel 2007 was used. To analyze them, we used a statistical package SPSS version 21.0 for Windows. With it, a series of statistic tests were done, such as: a) K-S test(KOLMOGOROVSMIRNOV) in order to establish the normality of the sample; b) Wilcoxon test to non-parametric samples, giving the significance when $p<0.05$;c) Central Tendency measures (average) and dispersion measures (standard deviation) in order to study and analize all the variables.

Results

Results are is structured in three blocks. First of all, results related to general images block are exposed. Secondly, the obtained results with the specific indoor football images analysis. Finally, the relation between data from the general block and the specific block. All data was gathered in four tables in which data related to the general images block valuation is shown (Table 2), data related to specific images valuation (table 3), averages of both block's data are compared (general and specific) (table 4) and the last one in which the statistically meaningful results ($p<0.05$) related to the verbal and visual valuation of both blocks are compared (table 5).

Table 2. General images block valuation.

Nº	T	verbalV	n	%	visualV	N	%	Fix	Ord	T1ªfix
1	I	Success	23	92,0%	Success	23	92,0%	14,09 ±4,461	7,09 ±3,059	51,66%
		Errors	2	8,0%	Errors	2	8,0%			
4	C	Success	21	84,0%	Success	18	72,0%	15,72 ±3,578	6,56 ±2,307	43,93%
		Errors	4	16%	Errors	7	28,0%			
6	C	Success	19	76,0%	Success	23	92,0%	16,30 ±2,867	5,43 ±1,854	34,61%
		Errors	6	24,0%	Errors	2	8,0%			
11	I	Success	21	84,0%	Success	25	100%	15,80 ±4,717	8,16 ±4,298	65,40%
		Errors	4	16,0%	Errors	0	0%			
13	C	Success	19	76,0%	Success	23	92,0%	16,0 ±2,860	7,22 ±3,044	44,83%
		Errors	6	24,0%	Errors	2	8%			
14	I	Success	25	100%	Success	24	96,0%	13,71 ±4,186	5,08 ±0,41	38,90%
		Errors	0	0%	Errors	1	4,0%			

Nº: image's number; **T**=image's type (I=incorrect; C=correct); **verbalV**= verbal valuation; **n**= subjects nº; **visualV**=visual valuation; **fix**= average of the fixings number with with standard deviation; **Ord**=order of the first fixing; **T1ªfix**=time of the first fixing(measured in % of the time in which the first fixing was done regarding the total time)

When we analyze the verbal valuation in the general images block, we observe that it is characterized by having a high number of successes. In addition, there is a little difference between the highest value (25 for image 14) and the lower value (9 for images 6 and 13) (table 2).

Both, visual and verbal valuation show a high numer of successes and a low difference between the highest and the lower value. Regarding the total numer of fixings carried out by the subjects during the whole viewing of the general type images, it is noticed that all of them present a similar number of fixings(between 13,72 and 16,30) (table 2)..Therefore, in most of the images exist a similar number of fixings. There is a lower difference between subjects in the average of the first fixing in the selected area (5,08 and 8,16) (Table 2), than in the fixing time (34,61% and 65,40%) (Table 2), that is to say, almost all the subjects have similar skills to carry out the first fixing, but really variable skills on the time taken to perform it (table 2). When we compare the verbal and visual valuations, we can see that even though the average of the success number of the visual valuation is higher, the values are close in both valuations.

Table 3. Specific image's block valuation

Nº	T	verbalV	n	%	visualV	N	%	Fix	Ord	T1ªfix
2	C	Success	21	84,0%	Success	23	92,0%	16,26 ±2,783	3,17 ±3,157	21,16%
		Errors	4	16,0%	Errors	2	8,0%			
3	C	Success	22	88,0%	Success	24	96,0%	15,58 ±2,653	5,04 ±3,342	33,04%
		Errors	3	12%	Errors	1	4,0%			
5	I	Success	15	60,0%	Success	3	12,0%	17,33 ±5,132	8,33 ±7,506	47,49%
		Errors	10	40,0%	Errors	22	88,0%			
7	C	Success	22	88,0%	Success	18	72%	12,83 ±2,065	6,11 ±2,988	48,56%
		Errors	3	12%	Errors	7	28%			
8	C	Success	17	68,0%	Success	21	84,0%	15,48 ±3,710	6,67 ±2,708	45,24%
		Errors	8	32,0%	Errors	4	16%			
9	I	Success	17	68,0%	Success	20	80,0%	14,55 ±2,645	7,30 ±2,886	49,71%
		Errors	8	32,0%	Errors	5	20,0%			
10	C	Success	15	60,0%	Success	11	44,0%	16,64 ±2,838	8,09 ±5,108	48,44%
		Errors	10	40,0%	Errors	14	56,0%			
12	I	Success	20	80,0%	Success	15	60,0%	15,40 ±4,205	6,87 ±3,642	46,88%
		Errors	5	20,0%	Errors	10	40,0%			
15	I	Success	10	40,0%	Success	24	96,0%	16,33 ±4,205	6,71 ±3,782	42,00%
		Errors	15	60,0%	Errors	1	4%			

Nº: image's number; **T**=image's type (I=incorrect; C=correct); **verbalV**= verbal valuation; **n**= subjects nº; **visualV**=visual valuation; **fix**= average of the fixings number with with standard deviation; **Ord**=order of the first fixing; **T1ªfix**=time of the first fixing(measured in % of the time in which the first fixing was done regarding the total time)

The verbal valuation of the specific images shows that the number of successes is higher than the error number in most of the images. In addition, there is more difference between the higher value(image 14) and the lower value (images 6 and 13) (table 3). The specific visual valuation, shows that the number of successes is higher than the number of errors in most of the cases, and like in the previous case, there are bigger differences between maximum and minimum values of successes. We can also observe in some cases, that errors overcome success like it happens in images 5 and 10 (Table 3). In respect of the average of the fixing number of the specific block, fluctuates between 12.83 and 17,30 (Table 3). In this case, the differences regarding the general images block are minimal. The average of the place occupied the first fixing in the inerest area is situated in a wider range than the case of the general block, (3.17 -8.33) (table 2) However, the time during the start of the image's

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evaluation until the first fixing on the selected area is, as the case of the general block, so changing, since it is situated between 21.16% and 49.71% (Table 3) Curiously, when we compare the success average of both valuations (viual and verbal) the specific block are really similar. If we compare with the block of general images (n= 21,33 for the verbal valuation; n= 22,6 for the visual valuation) there is a averaging less successes than in the last mentioned one (n=17,67 in both valuations). (Table 4; Figure 5)

Table 4. Both blocks average's comparison

		verbalV		visualV	Fix	Ord	T1ªfix
general	Success	85,3%	Success	90,6%	15,27	6,59	46,5%
	Errors	14,7%	Errors	9,7%			
specific	Success	70,6 %	Success	70,7%	15,6	6,47	42,5%
	Errors	29,4%	Errors	29,3%			

Nº: image's number; **T**=image's type (I=incorrect; C=correct); **verbalV**= verbal valuation; **n**= subjects nº; **visualV**=visual valuation; **fix**= average of the fixings number with with standard deviation; **Ord**=order of the first fixing; **T1ªfix**=time of the first fixing(measured in % of the time in which the first fixing was done regarding the total time)

Comparing the obtained results of both bocks, the subjects are able to better value in a verbal and visual way the images inside the general block, even though both cases have a huge difference between the successes and error number (Figure 5). This may indicate a higher general formation of the subjects taking part on this research.

It must be said that, the fixing number and the order of the first fixing are similar in both bocks, and the time until there is a fixing on the selected area, is slightly higher in the general block than in the specific block (Figure 5)
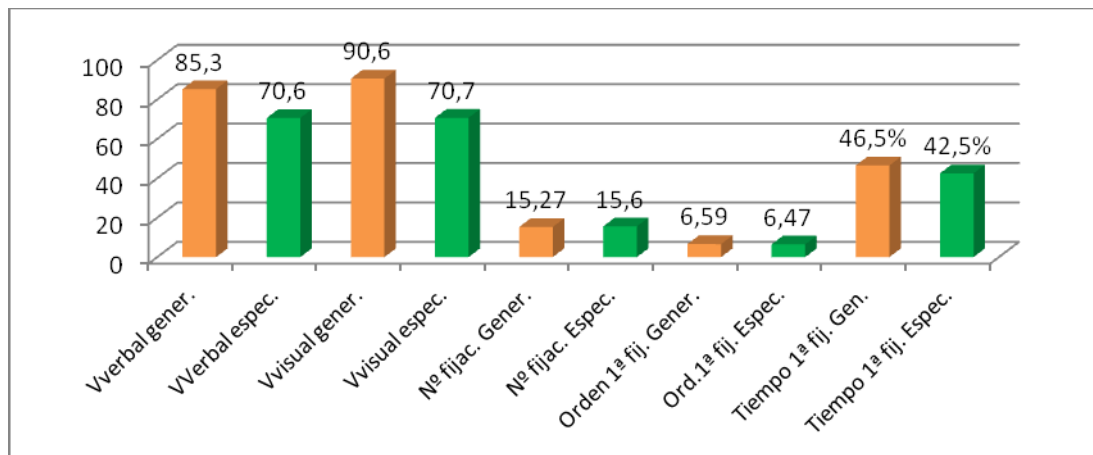
Figure 5. Verbal and visual valuations , fixing number, order and time of the first fixing on the selected area of both, general and specific blocks. Orange the general block and green the specific block.

When we associate verbal and visual valuations, we can verify that there are more statistically significant comparaisons n the images of the specific block. A significant statistic was obtained in four images of the 6 shown (66,6%). In the case of the images related to the indoor football technique , we obtained importat results in 3 of them, which represent the 33,3% (images 5,9 and 15) (Table 5).

Table 5. Statistically significative comparaisons betwenn VerbalV and VisualV. VerbalV= verbal valuation; VisualV= Visual Valuation.

	visualV1 verbalV1	visualV5 verbalV5	visualV6 verbalV6	visualV9 verbalV9	visualV11 verbalV11	visualV14 verbalV14	visualV15 verbalV15
Sig. Asintót.(bilat)	,000	,035	,046	,001	,000	,000	,007

Discussion and conclusions

We agree with all the authors that the researches in sports have developed on a par with the different study techniques, to give a greater loyalty to them (Vila et al, 2012). In our case, we used eye-tracking technology, so we could characterize in a factual way the visual strategies (Morenas, 2014). Morover, we appreciate perception is a " primary process of

elaborating information, what makes it a key factor for every sportive action"(Pedraza and López, 2015). In sports, this visual behavior was studied from different prespectives, and one of the most recurrent are the differences between experts and novice (Vila et al, 2012), (Vila et al, 2010). In this regard, we investigated the global and specific knowledge in a sportive discipline (indoor football) of future PE teachers according to their experiences during the CCAFYD degree, even though personal sportive experiences will also influence.

In the general block it was observed that an average of 85,3% of the verbal evaluaions were correct. Also, that 90,6% of the cases show at least one fixing on he interest area, this shows that most of the students could evaluate the technique execution of the image from a single area observation. Comparing these with the results obtained in the indoor football technique block (70,6% of verbal valuations correct; 70,7 % of the subjects observed the interest areas), we agree with the fact that there are systematic differences in the capture of information betwee experts and novice subjects in a single field (Abernethy, 1988). "Following this, we could agree with Amazeen, Amazeen and Beek, 2001; Cattew et al, 2010; Ruiz et al 2013, when they said experts on a specific area, in this case CCAFYD students, can identify in a better way, use and acquire more accurately the visual information analyzing concrete images of that specific topic (general image block), comparing with the other specific images of a concrete sport that they could not dominate that well.

If we consider what was mentioned until now, we could consider that there are evaluations of executions of thechnical general and specific gestures of a sport, and the first case better than the second one. This means that they show a higher sportive formation in a general level better than on a specific level in this concrete sport.

On the other hand we analyze also the number of fixings on the image and the moment of the first fixing on the interest area. The average of the fixing numer of the strength at the gym images block was 15,225. The place of the firsst fixing was found around 6,59 of average. In addition, the first fixing was done averaging when the time was 46,77% of the observation. In this case, the results are similar to the ones obtained in the technical indoor football block. (15,6 fixings; first fixing on the area in place 6,47, with 42,5% of the time of the observation) Our results differ from other authors who concluded that subjects with more

experience carried out a lower number of fixings than the novice ones in thi field(Reina, Moreno and Sanz, 2007), (Arrollo and Sebastián, 2013), (Vickers, 1988). Our results show that there is no difference on the searching patterns, because the subjects need almost the same fixings in both blocks and the searching pattern of evaluating items is also similar. Thi may be due to the fact that the differences between experts and novice subjects is not given by the visual searching strategies by themselves, but to the use of the available information (Abernethy, Thomas and Thomas, 1993)

Morover, we wanted to know the coherence at the images evaluating time of both blocks. The comparaison between verbal and visual valuations referred to global knowledge of the fture teachers, showed a statistical significance in four out of six images (66,6%) Technique indoor footboall images showed only significative results in 3 of them, which represented 33,3% of the whole image's block.. However, in one of them, this correlation exist due to the visual valuation error (12%, image 5) that is why we could reduce the percentage even more..This may establish that there is a higher evaluating coherence in general strenght sportive gestures due to a higher formation experience. In this regard, we agree to say that students have more general knowledge and that is why in most of the cases, they know how to evaluate and where should they guide their searching pattern (Vickers, 1988) However, they need a higher formation in order to be more efficient with the time, and guiding their look in advance to the area which lets them evaluate the error or success of the execution.

Our research has some restrictions, since " experimental situations devised to be developed in a labortory, may change the potential advntages that the expert subjects could have, because the experimental basis of the duty are removed out of their normal context, making this kind of subjects use a different information to solve a particular problem" (Agernethy et al., 1993) Also, it must be considered that when we arbitrarily choose a sample out of the CCAFYD college, we could have chosen a subject with indoor football experience. Morover, another limitations consist in the fact that the subject cannot do any movement with his or her head, so the efficiency of the viewing could have been limitated. Thus, on future researches we could try to carry out valuations with a method which simultes a real situation. Another restriction of the eye-tracking system is the difference between "to see" and "to look"

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(Abernethy, 1993) and the lack of knowledge of the retina's periphery role on the dynamic captured information (Just nd Carpenter, 1976)

It would also be interesting to make wider the sample of the research using other universities in order to compare the formation between them, or compare the obtained results after analyzing the experts of one sport with PE professionals.

Conclusions

The conclusions we obtained are that the future Physicall Education teachers:

1. They have enough formation to make verbal and visual valuations in a correct way regarding general sportive issues (90% and 85% respectively)

2. If we face valuationgs of specific sportive content, the 72% of the evaluators make it properly , and 67% actually know the evaluation requirements (correct visual valuation)

3. Their visual and verbal valuation is better regarding general aspects of the sportive activity than specific aspect of a single sport.

4. They need a higher formation/experience to improve searching patterns to be able to be more efficient on their visual valuation.

5. There are barely differences on the searching patterns of valuation between general and specific image's block.

6. .There is a higher statisticall significance ($p => 0.05$) between verbal and visual valuation in the general image's block than in the indoor football specific one.

7. They need to continue their academic formation in other areas in order to have a higher specific knowledge about a particular sport.

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