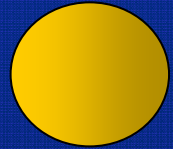




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## THE VISUAL SEARCH IN SERVICE RETURN IN TABLE TENNIS

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Mind In Sport Lab



Regional Committee of  
Friuli Venezia Giulia

This work belongs the field of research that analyze the relations between visual perception and sports performance



# Theoretical Foundations

- Ecological Psychology
- Cognitive Psychology
- Eye Movements
- Biological Motion

The improved technology has decreased the number of hits per rally. For this reason the serve and the immediate return are primary importance. (D.Djokic 2003).

According to some studies the speed of the ball can reach 160 Km/h (Major & Lang 2003) and a spin of 8000 rpm(Ushiyama, e coll. 2003)

On the service return, the motor response is very important, but the visual selection of the significant information at the right time is also important .

There are few studies on table tennis. More information comes from other sports like, cricket and squash.

Ripoll & Fleurance (1988) studied five top-players with eye movements system and they found that only the first part of the ball flight was tracked.

Abernethy (1990) studied squash using a temporal occlusion methodology. He found that expert players were more accurate in predicting stroke force and stroke direction than novices.

Land & McLeod (2000) in cricket, comparing players with different skill levels they found that a short latency for the first saccade distinguished good from poor batsmen, and that eye movements strategy contributes to increase skill in the game.

Rodrigues, Vickers and Williams (2002) in table tennis, show that skilled participants demonstrated an earlier ball tracking and recorded higher performance accuracy than less skilled player.

A practical observation:

It is important to return the service of the opponent  
with efficacy....

Question: Is there a difference in visual perception between experts and non experts in predicting the trajectory of a ball during service return in table tennis?

How is the information selected by experts compared with novices?



We gave an answer to this questions in two experiments the data were presented in FEPSAC 2007 conference (Bianchi, Agostini, Domini, et al.).

We investigate, in a video based task, how table tennis players can guess the direction of a service and which are the most important cues by using temporal and spatial occlusion.



# We found that:

## **Esp1: temporal occlusion**

In general, the performance increase with time this could suggest that there is an increase of the amount of visual information available.

Experts perform always better than novice

## **Esp2: spatial occlusion**

The absences of the ball cause a consistent decrease of the performance.

# directions

- Run experiments in natural environment
- Use a metric scale to define the answers
- Use a system in 3D stereo vision
- • Study how players detect the spin of the ball

## Experiment 3 :temporal occlusion







The movies ended at five different times of the service (*variable temporal occlusion*):

1) Begin of the service (-T2)



2) When the ball is on the top (-T1)



3) When the paddle hit the ball (T0)



4) In an intermediate position (T1)

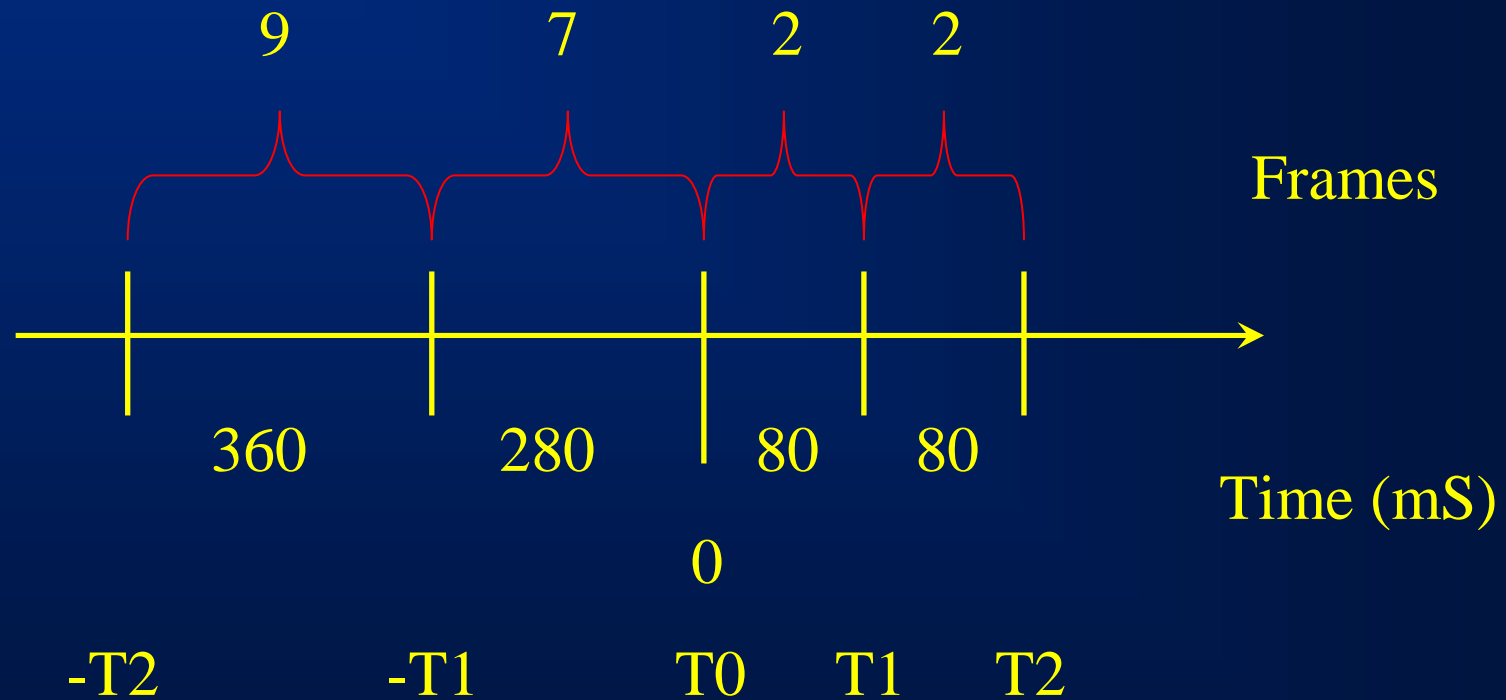


5) On the bounce on the table (T2)



# Occlusion Timing

Fps=25     $1/25=40$  mS



5 conditions x 4 services x 4 repetitions = 120 trials

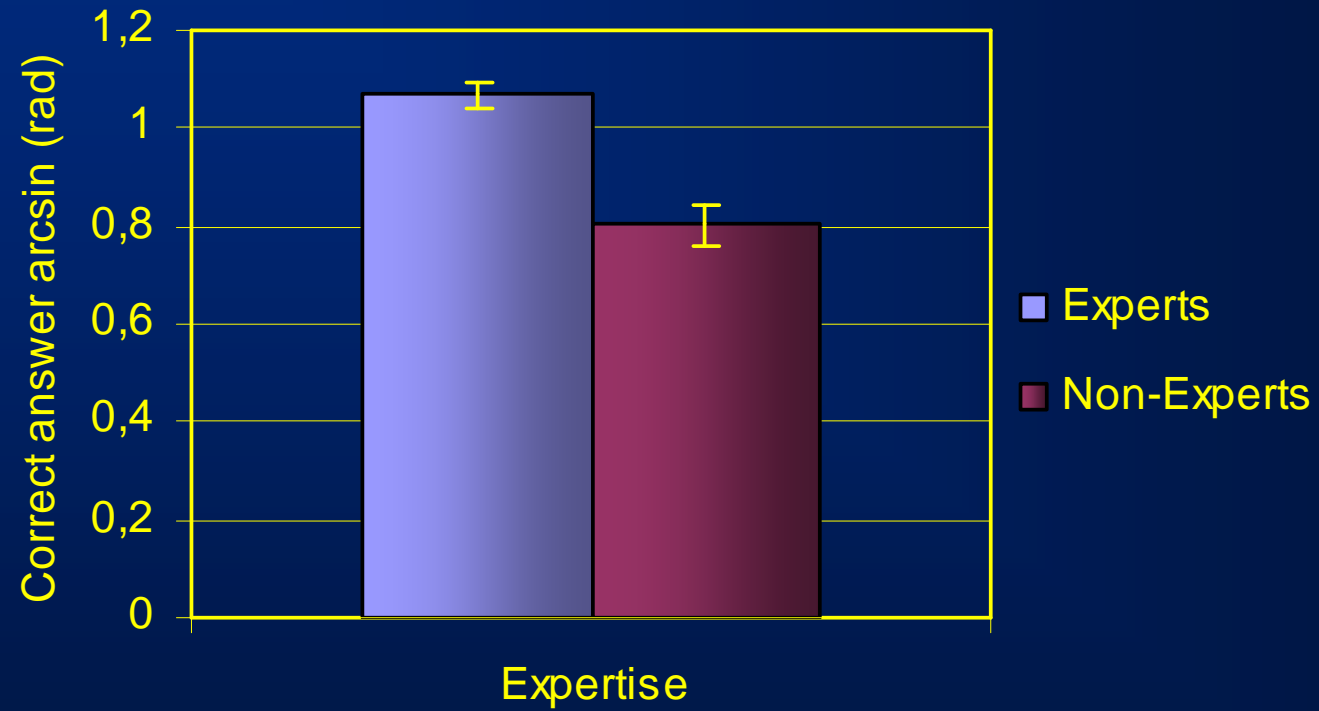
The subjects must perform 120 trials

They have to predict the kind of service

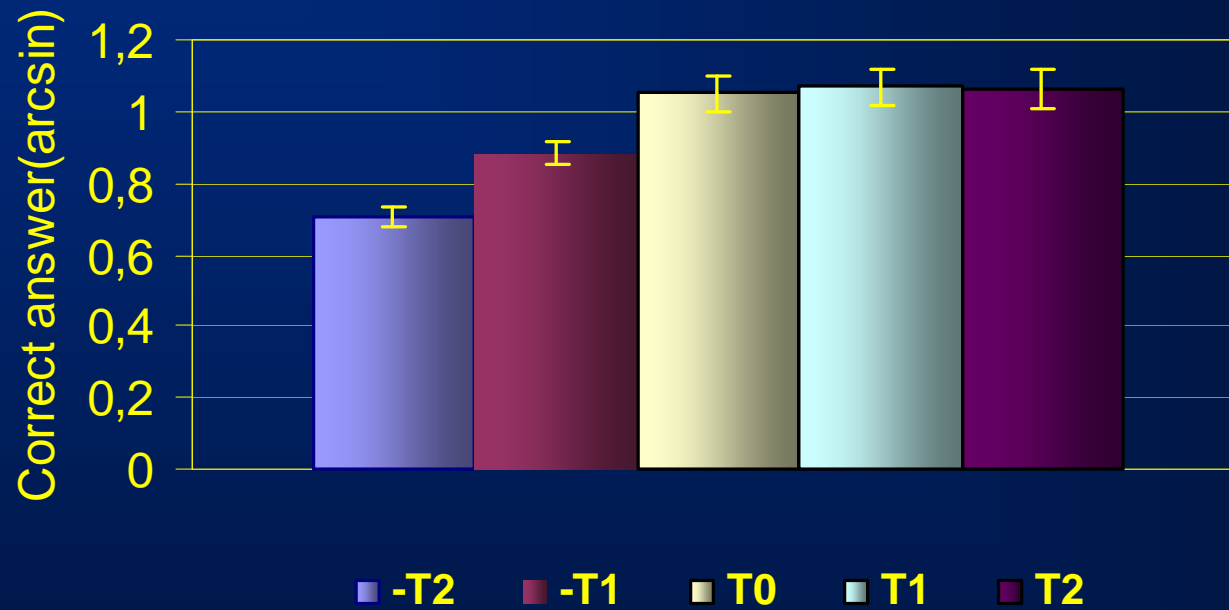




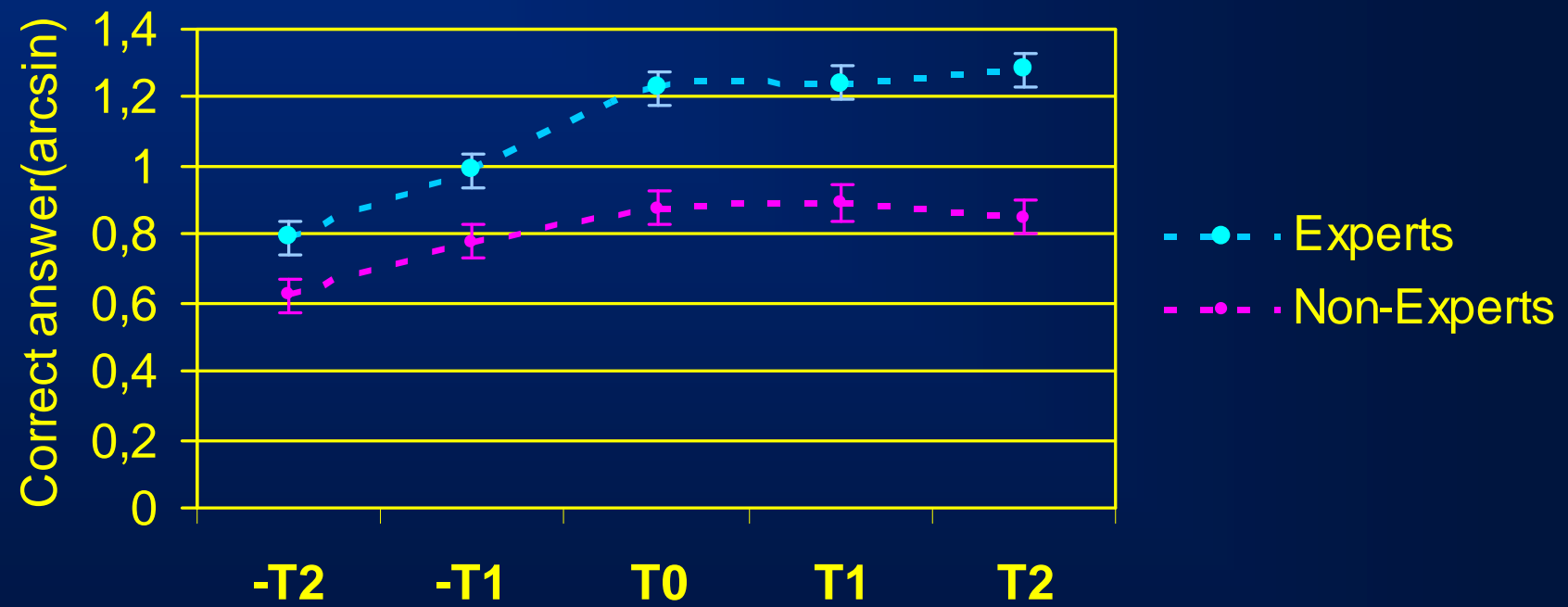
## Correct answer arcsin as a function of Expertise



## Main effects of the variable temporal occlusion

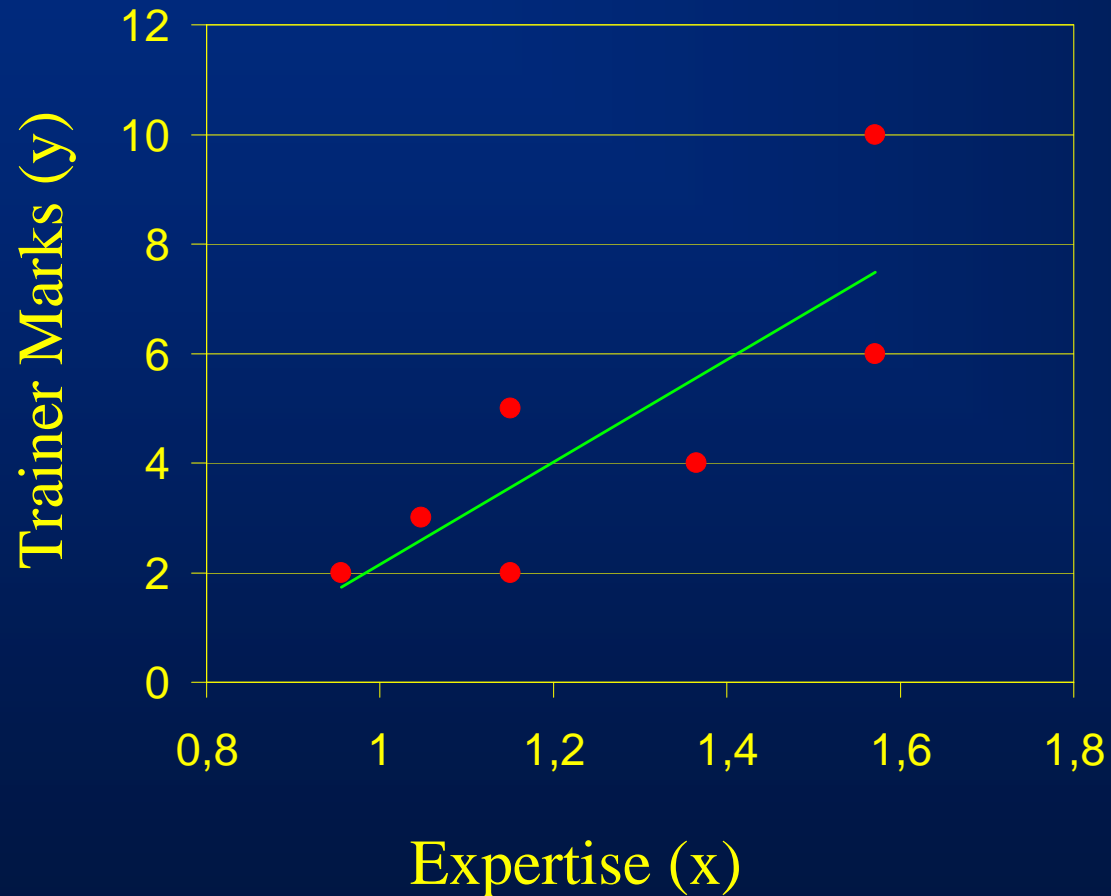


## Main effects of the variable temporal occlusion split by expertise



# Condition T0

Regression of y on x



Subjects	X	Y
S1	1,57	10
S2	0,95	2
S3	1,15	5
S4	1,57	6
S5	1,15	2
S6	1,36	4
S7	1,04	3

Correlation = 0,81

$$y = 0,0718x + 0,9305$$

$R^2 = 0,6705$

Where is the information hidden in  
space?

## Experiment 4: spatial occlusion

C0  
(T2)



C1



C2



C3



4 conditions x 4 services x 6 repetitions = 96 trials

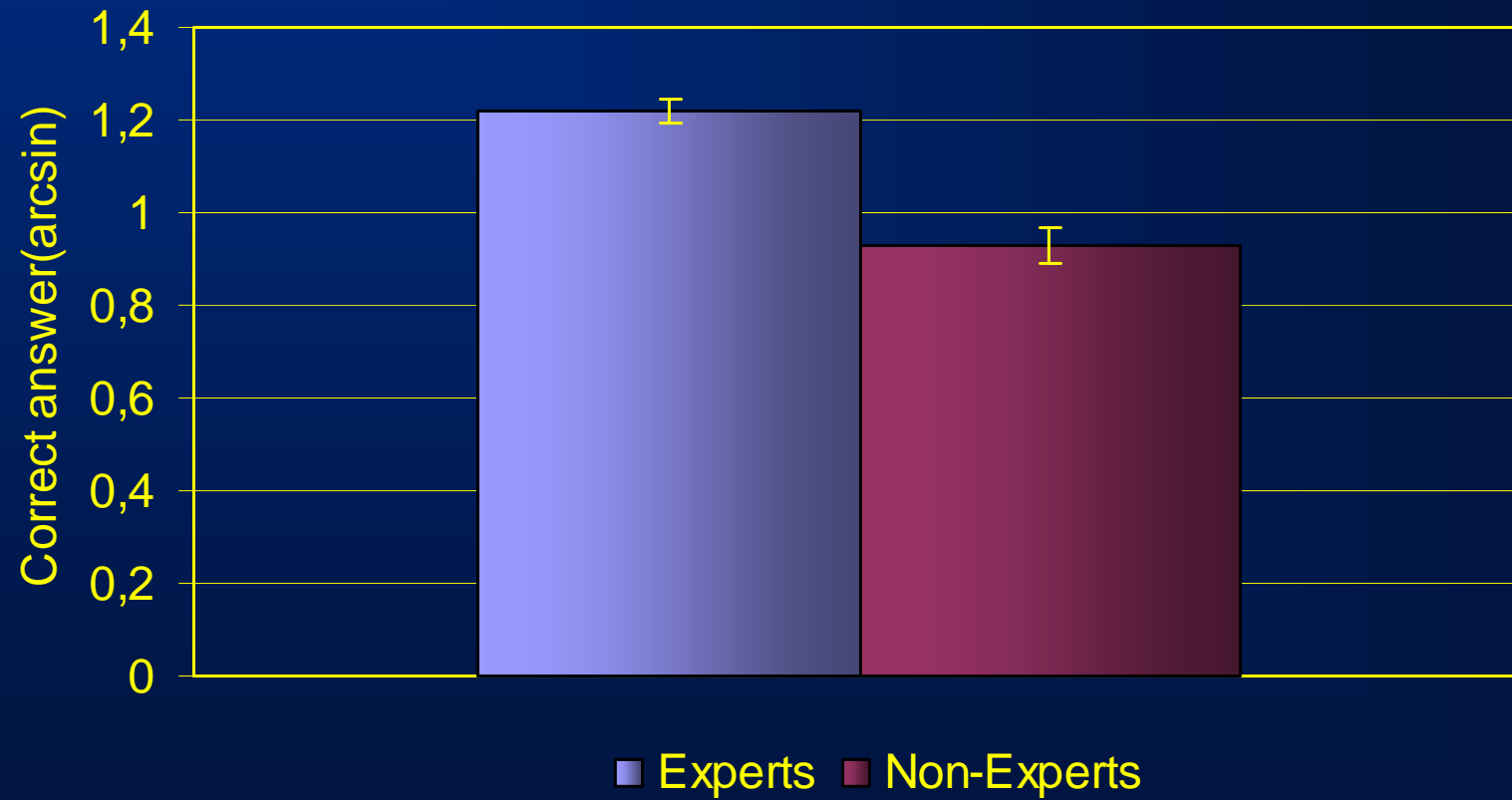
The subjects must perform 96 trials

They have to predict the kind of service

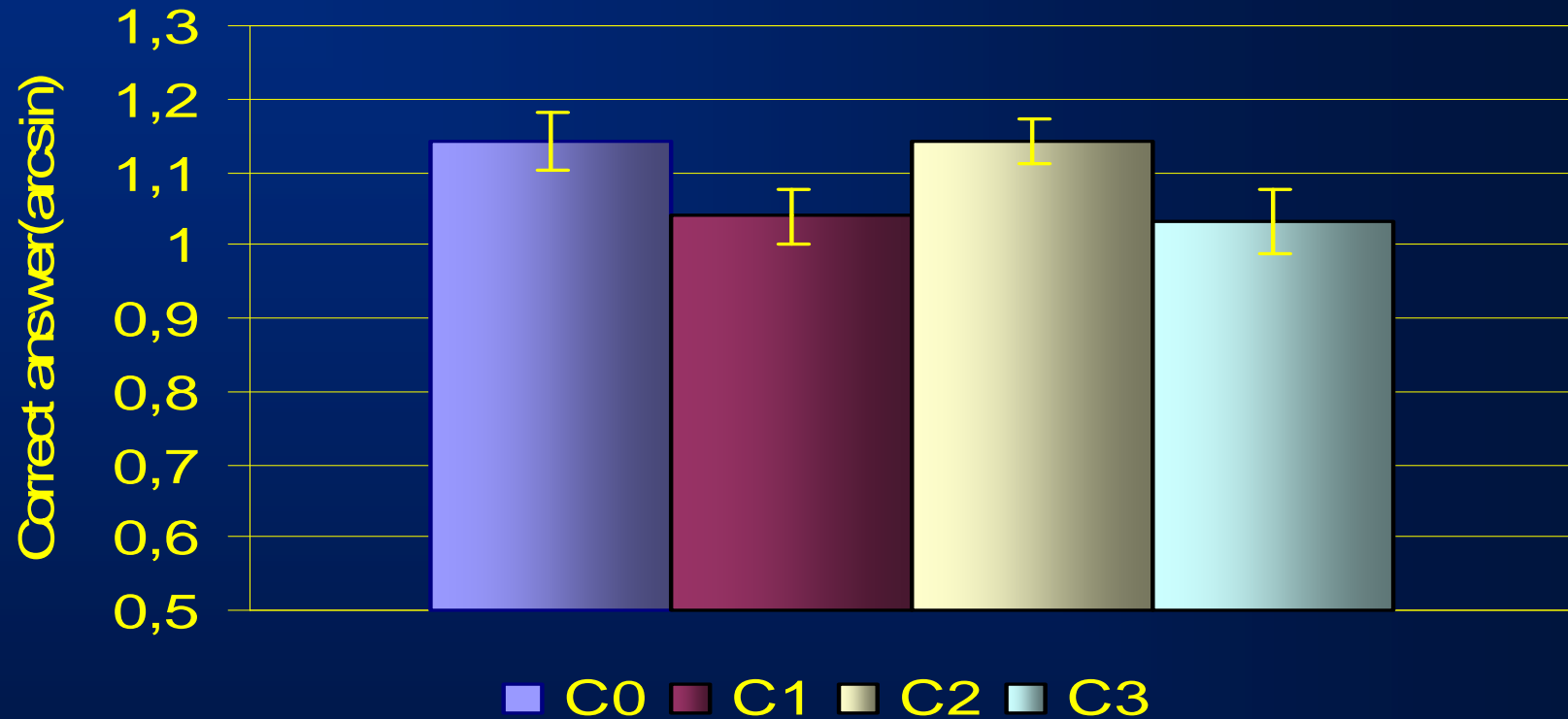


## Esp 4

### Correct answer as a function of Expertise



## Esp 4 Corrcets answer as a functions differents occlusions



C0 (T2)  
complete

C1 No  
body

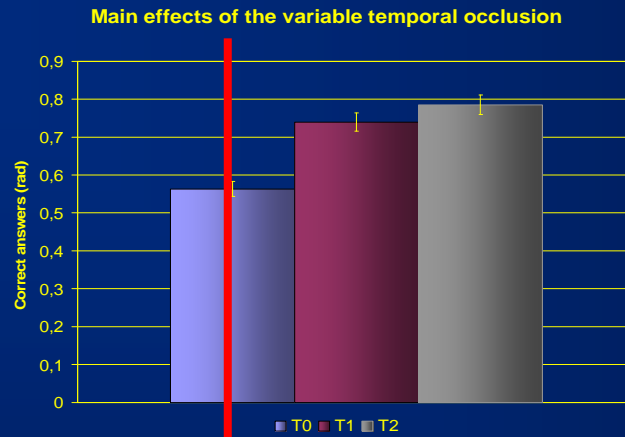
C2 No  
ball

C3 No  
paddle

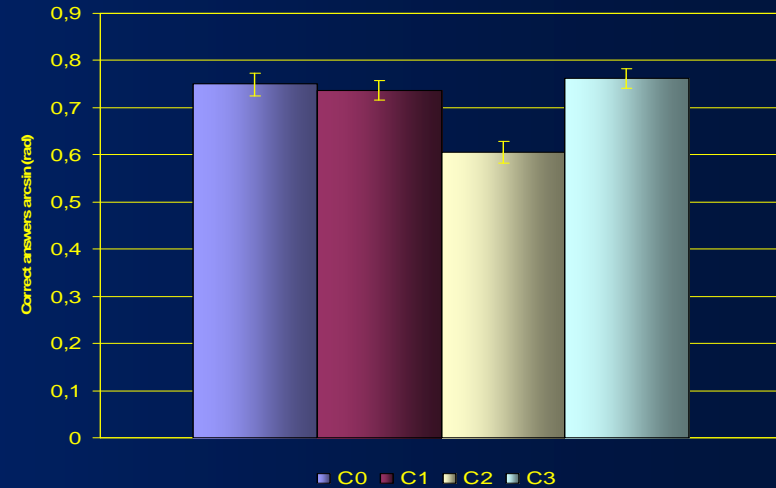
# Exp1: temporal occlusion

# Exp2: spatial occlusion

Dir



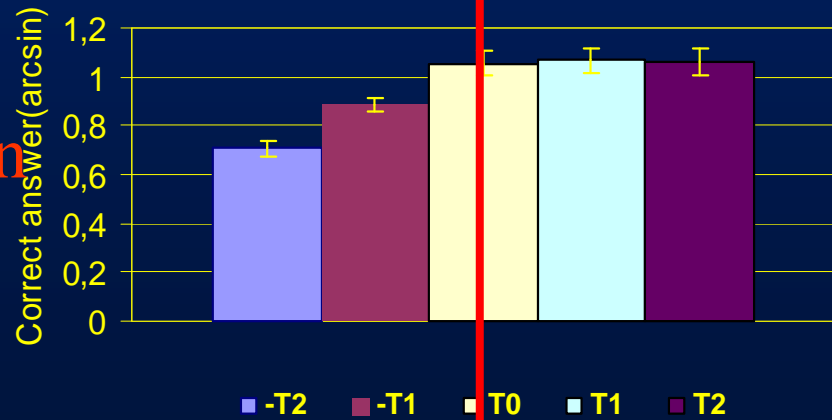
Corrcets answer as a function different condition



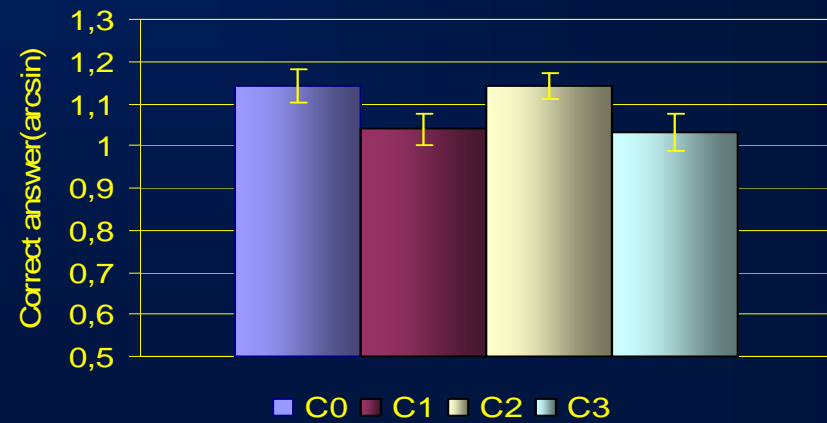
# Exp3

# Exp4

Main effects of the variable temporal occlusion



Corrcets answer as a functions differents occlusions



Spin

IMPACT

# Practical suggestions

...and the next time that you play  
table tennis...



.. just go around a table and PLAY !

Thanks