

Research Article

Influence of Divided Attention on Sports Performance Among Basketball Players of the Sports Association of the National Institute of Youth and Sports of Abidjan (AS INJS Abidjan, Ivory Coast)

Paterson Valery Disseka^{1, 3, *} , Emmanuel Diboh² , Niemtiah Ouattara³ ,
Amon Devane Christ Axel Koumi³, N'guessan Kouame¹, Leon Glin³,
Neme Antoine Tako³ 

¹Laboratory of Human Movement Sciences, Development and Well-Being, National Institute of Youth and Sports, Abidjan, Côte d'Ivoire

²Teaching and Research Unit in Animal Physiology, Faculty of Environment, Jean Lorougnon Guélé University, Daloa, Côte d'Ivoire

³Teaching and Research Unit in Neuroscience, Laboratory of Biology and Health, Faculty of Biosciences, Félix HOUPHOUËT-BOIGNY University, Abidjan, Côte d'Ivoire

Abstract

Context: In modern team sports such as basketball, athletic performance plays a central role, both in promoting athletes and in the attractiveness of the discipline. It directly conditions collective and individual success. However, in the African competitive context, the cognitive determinants of this performance, particularly the role of attentional mechanisms such as divided attention, remain insufficiently explored. **Objective:** This study evaluates the influence of divided attention on the athletic performance of basketball players from the Sports Association of the National Institute of Youth and Sports of Abidjan. **Methodology:** The study is analytical, cross-sectional and quantitative. It is conducted using a sample of 36 athletes (18 men and 18 women) playing in the second division of the national basketball championship. For data collection, a neuropsychological test (symbol grid) is used to assess divided attention and a match observation grid to measure sports performance in 3-on-3 (3 x 3) format matches. **Results:** The results show that women have a higher visual accuracy rate and a higher level of divided attention than men. However, memory accuracy does not show a significant difference between the sexes. The level of divided attention does not vary significantly depending on the outcome of the match. Technical-tactical performances, such as rebounds and assists, are influenced by the level of divided attention, while interceptions do not seem to depend on attention. Finally, game errors, such as turnovers and fouls, are influenced by the level of divided attention. **Conclusion:** The study concludes that divided attention positively influences certain sports performances in basketball players, including rebounds and assists, but has no significant impact on shooting performances. She therefore suggests integrating cognitive training into the preparation of study subjects to optimize their specific skills.

*Corresponding author: patersondisseka2@gmail.com (Paterson Valery Disseka)

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Keywords

Divided Attention, Sports Performance, Basketball, Sports Cognition, Ivory Coast

1. Introduction

Sports performance is a central issue in modern team sports, both for the promotion of athletes and for the attractiveness of the disciplines concerned [1, 2]. This multidimensional phenomenon, characterized by its universality and significant socio-economic impact, is attracting growing scientific interest due to its practical implications in the optimization of competitive strategies [3]. In the field of basketball, a dynamic sport that requires complex neuro-motor coordination, Memmert and al. [4] point out that performance is particularly important because it directly determines the collective and individual success of players. However, despite this situation, the concept of sports performance remains insufficiently explored from the perspective of cognitive determinants in African competitive contexts, particularly with regard to the influence of attentional mechanisms.

Among the potential explanatory factors, divided attention, which is defined as the ability to process multiple sources of information simultaneously, emerges as a prime candidate to explain performance variations in open sports such as basketball [5, 6]. This research therefore aims to examine the influence of this form of attention on sports performance among basketball players in developing African countries, particularly those in the Sports Association of the National Institute of Youth and Sports in Abidjan.

Hughes and Bartlett [7] define athletic performance as the integrated expression of technical, tactical, and physical skills measurable during competitive activity. In basketball, this performance is generally manifested through three fundamental dimensions: shooting performance, which evaluates the effectiveness of scoring attempts [8]; technical-tactical performance, including rebounds, assists, and steals [9]; and field errors, including turnovers and fouls committed [10]. Each of these dimensions has distinct cognitive determinants. Shooting performance is highly dependent on focused attention, as demonstrated by Vickers [11] in an eye-tracking study revealing that elite shooters maintain a 40% longer fixation time on the target than novices. Technical-tactical indicators, on the other hand, mobilize more divided attention. Indeed, Memmert and Furley [12] show that expert players simultaneously process the movements of teammates (spatial memory) and the opponent's trajectories (perceptual anticipation), generating approximately 30% more assists. Finally, game errors are mainly explained by transient attentional failures, with a significant negative correlation between the level of divided attention and ball losses observed in professional matches [13].

While this knowledge establishes general links between cognition and performance, its applicability to the specific context of Ivorian national-level basketball players remains uncertain, particularly with regard to the differentiated impact of divided attention on each of the dimensions of sports performance mentioned.

A major gap therefore remains concerning the quantitative influence of divided attention on sports performance among AS INJS Abidjan athletes, particularly in light of the cultural and structural particularities of African basketball [14, 15]. Thus, the central question of the present research is the following: To what extent does divided attention influence sports performance among AS INJS Abidjan basketball players? Solving this problem would make it possible to develop cognitive training protocols adapted to local realities, potentially generating substantial competitive gains.

The general hypothesis formulated is that divided attention positively influences sports performance among AS INJS Abidjan basketball players. More precisely, we formulate that:

- 1) Subjects with better divided attention will have better shooting performance;
- 2) Subjects with better divided attention will have better technical-tactical performances, particularly in terms of rebounds, interceptions and assists,
- 3) Subjects with better divided attention will make fewer game errors, such as turnovers and fouls.

2. Material and Method

2.1. Type and Duration of the Study

The study is analytical, cross-sectional and quantitative. Data is collected during competitions organized for this purpose. This collection lasted two (02) weeks and the analysis of the results lasted a total of three (03) weeks.

2.2. Material

2.2.1. Topics

The study was conducted in Côte d'Ivoire among athletes from the basketball team of the Sports Association of the National Institute of Youth and Sports of Abidjan (AS INJS

Abidjan). It focuses particularly on athletes playing in the second division of the national basketball championship.

2.2.2. Technical Equipment

(i). Data Collection Equipment

Data collection involves two types of tools. On the one hand, a paper-based neuropsychological test (symbol grid) is used to assess athletes' divided attention (Figure 1). This test is presented in the form of a grid of 400 squares (20x20) containing various sports objects. Among these objects, two are considered target objects (the basketball and the baseball), the others being distractors. The test simultaneously measures two specific components of divided attention: visual recognition and counting memory, through a task of location (identification and circling of basketballs) and symbol counting (counting baseballs) under a time constraint (2 minutes). On

the other hand, a match observation grid is used to evaluate the athletic performance of players during 3 x 3 basketball games (Figure 2). This grid allows recording various indicators of athletic performance in game situations, such as successful shots, assists, rebounds, steals and turnovers, for each player during each game.

(ii). Data Processing Equipment

Statistical data analysis is performed using XLSTAT software (version 2024) integrated into Microsoft Excel. This software, as an Excel add-in, provides a familiar environment for performing all data processing. It allows for guided entry of raw data into Excel, the execution of appropriate statistical analyses, and the generation of results representations (tables and graphs), while facilitating the application of various statistical tests directly from the spreadsheet.

Player (athlete) : _____

Sex: ☐ Male ☐ Female

Age: ____ years



Légende :

- Boxing glove
- Baseball
- Loudspeaker
- Jersey

- Soccer ball
- American football
- Goal net
- Stopwatch

Number of objects counted : _____

- Sports shoes
- Rugby ball
- Basketball

Figure 1. Symbol grids (visual search task combined with counting).

Date : _/ _/ _		Session No.: _		Match No.: _	
Team :		Team :		Team :	
Player (athlete)	Gender	Age	Player (athlete)	Gender	Age
J.....:			J.....:		
J.....:			J.....:		
J.....:			J.....:		

Variables	Description of variables (indicators)	Team				Team			
		J....	J....	J....	Total ..	J....	J....	J....	Total ..
2-point shots attempted	Number of shots taken inside the 3-point line (2-point area).								
2-point shots made 2-	Number of 2-point shots scored								
point shooting percentage	$(2\text{-point shots made}/2\text{-point shots attempted}) \times 100$								
3-point shots attempted	Number of shots taken from outside the 3-point line Number								
3-point shots made 3-	of 3-point shots scored								
point shooting percentage	$(3\text{-point shots made}/3\text{-point shots attempted}) \times 100$								
Free throws attempted	Number of free throws attempted after a foul								
Successful free throws	Number of free throws scored								
% of successful free throws	$(\text{Free throws made}/\text{free throws attempted}) \times 100$								
Offensive rebounds	Number of times the player recovers the ball after a missed shot by his team								
Defensive rebounds	Number of times the player recovers the ball after a missed shot by the opposing team								
Assists	Number of passes that directly lead to a field goal								
Turnovers	Number of times the player loses possession of the ball (bad pass, offensive foul, walking, etc.)								
Counter (or blocks)	Number of opposing shots legally stopped by the defending team player								
Interceptions (or steals)	Number of times the player intercepts or steals the ball from the opposing team								
Mistakes committed	Total number of personal fouls committed by the player (illegal contact, unsportsmanlike, etc.)								

NB: The non-greyed fields must be completed before and during the match, while the greyed fields must be completed later.

Figure 2. Evaluation grid for technical and tactical performance during a 3-on-3 basketball match.

2.3. Method

2.3.1. Technical Equipment

The study subjects are recruited by non-probability sampling known as convenience sampling. A total of 36 athletes (18 women and 18 men) are included in the study. From these

36 subjects, six (06) 3 x 3 basketball matches are organized, with three matches between men's teams and three matches between women's teams. Each match pits two teams of three players of the same sex against each other. Thus, 12 different teams are formed (6 men's teams and 6 women's teams) to participate in these experimental meetings (Table 1).

Table 1. Description of the sample according to teams and matches.

Team	SEX								Grand total
	Men				Women				
	Match 1	Match 2	Match 3	Total men	Match 4	Match 5	Match 6	Total women	
A	3			3	3			3	6
B	3			3	3			3	6
C		3		3		3		3	6
D		3		3		3		3	6
E			3	3			3	3	6
F			3	3			3	3	6
Total	6	6	6	18	6	6	6	18	36

NB: Teams A, B, C, D, E and F each designate two distinct entities (a men's team and a women's team have the same letter). Each team is composed of 3 players and only participates in one match.

2.3.2. Method of Selecting Subjects

(i). Inclusion Criteria

Subjects participating in the study must meet the following inclusion criteria:

- 1) Be an active member of the AS INJS basketball team of Abidjan playing in the second national division;
- 2) Have given free and informed consent to participate in the study;
- 3) Be available for the entire research protocol, whether for administering the cognitive test or participating in the matches.

(ii). Exclusion Criteria

The following criteria result in the exclusion of a subject from the study:

- 1) Have a physical injury or medical condition that may limit athletic performance or prevent the cognitive test from being performed normally;
- 2) Have a diagnosed neuropsychological disorder such as severe attention deficit or cognitive impairment;
- 3) Not being able to participate in one of the two data collection phases or dropping out during the study.

2.3.3. Data Collection Method

Data are collected in two phases. First, each subject's cognitive abilities are assessed individually using the Symbol Grid Test. This test, administered in a classroom at INJS under standardized conditions, measures each athlete's level of divided attention before the athletic events. Second, athletic performance is measured in real-life situations during 3x3 basketball matches. During each match, an observer (a member of the athletes' support team) enters the various performance indicators for each player on the corresponding evaluation grid. The different matches are played according to the official rules of 3x3 basketball. Generally, 3x3 basketball is played on a half-court with a basket, between two teams of three players. The match lasts 10 minutes or until one team reaches 21 points. In case of a tie, overtime takes place until one team leads by two points [16].

2.3.4. Data Processing Method

The statistical processing of the data is guided by the specific objectives of the study. First, the variable "cognitive performance", through its dimensions that are "visual accuracy rate", "memory accuracy rate" and "overall level of divided attention", is analyzed according to "gender". For each cognitive indicator, the means and standard deviations are calculated by group (men and women), then compared using a Student t-test for independent samples. The results of these analyses are presented in the form of box plots comparing the distribution of cognitive performance of men and women. Second, the variable "sports performance" is analyzed according to the

"level of divided attention" of the players. Specifically, three dimensions of the variable "sports performance" are considered: "basket shooting performance", "technical-tactical performance" and "game errors". For each of these dimensions, the subjects are divided into three groups according to their level of divided attention (low, medium or high). Since more than two groups are to be compared, a non-parametric Kruskal-Wallis test is used to determine the existence of significant differences between the distributions of each dimension of sports performance according to the level of divided attention. The corresponding results are presented in the form of bar charts describing the mean values per divided attention group. For both types of statistical tests carried out, the statistical significance threshold called alpha is set at 0.05 ($\alpha = 0.05$) and significant results are indicated by stars.

3. Results and Discussion

3.1. Results

3.1.1. Analysis of Cognitive Performance According to Gender

The cognitive performances of the subjects are analyzed through three dimensions: the visual precision rate, the memory precision rate and the level of divided attention. First, concerning the visual precision rate, the results show that it is higher in women ($50.26 \pm 22.86\%$) compared to men ($32.50 \pm 16.93\%$). Moreover, this observed difference is significant ($p = 0.012$) in the Student t-test (Figure 3). Then, regarding memory precision, the results show a rate also higher in women ($75.71 \pm 29.97\%$) compared to men ($61.43 \pm 22.97\%$). But the observed difference is not significant ($p = 0.118$), according to the Student t-test (Figure 4). Finally, regarding the level of divided attention, the results still indicate a higher level in women ($63.00 \pm 20.83\%$) compared to men ($46.96 \pm 14.12\%$). Moreover, the observed difference is significant ($p = 0.011$), according to the Student t-test (Figure 5). In conclusion, in the present study, women describe better cognitive performance compared to men.

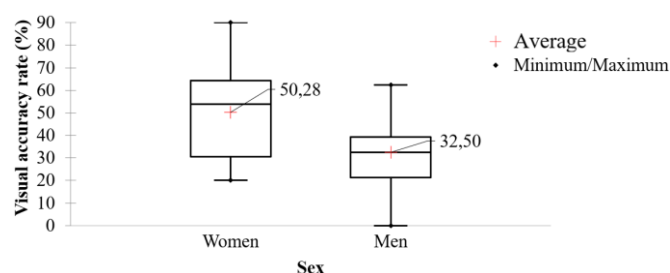


Figure 3. Visual accuracy rate of subjects by sex.

Student's t-test: $p = 0.012^*$ (significant difference between the two observed means)

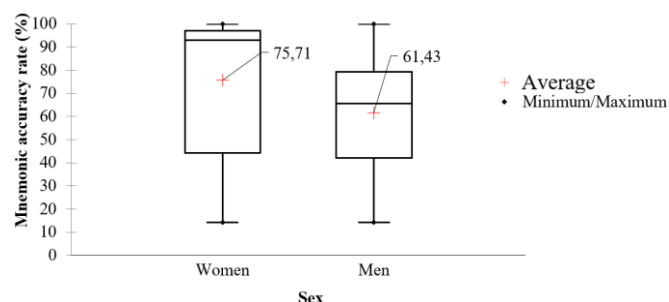


Figure 4. Memory accuracy rate of subjects by sex.

Student's t-test: $p = 0.118$ (no significant difference between the two observed means)

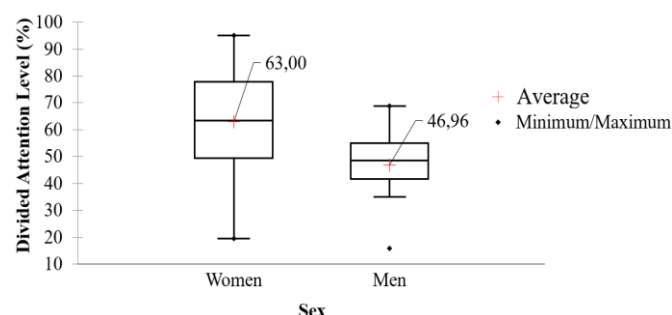


Figure 5. Divided attention level of subjects by sex.

Student's t-test: $p = 0.011^*$ (significant difference between the two observed means)

3.1.2. Analysis of Field Goal Shooting Performance as a Function of Divided Attention Level

Field goal shooting performance is analyzed in two dimensions: the level of divided attention based on the match result and the overall field goal success rate. First, regarding the average level of divided attention based on the match result, the results show that among women, the level of divided attention is slightly higher among winners ($66.55 \pm 17.35\%$) compared to losers ($59.44 \pm 24.35\%$). Conversely, among men, the level of divided attention is slightly lower among winners ($44.74 \pm$

18.23%) than among losers ($49.19 \pm 8.95\%$). However, these observed differences are not significant, whether in women ($p = 0.486$) or in men ($p = 0.521$), according to the Student t-test (Figure 6). Then, regarding the success rate in field goal shots according to the level of divided attention, women present an average success rate which tends to increase with the level of attention. Indeed, this success rate is 0.00% in weakly divided attention, $30.38 \pm 28.34\%$ in moderately divided attention, and $41.43 \pm 32.49\%$ in strongly divided attention. Similarly, in men, we observe variable success rates without a clear linear trend ($56.35 \pm 1.12\%$ in weakly divided attention, $37.50 \pm 0.00\%$ in moderately divided attention and $35.43 \pm 22.11\%$ in strongly divided attention). However, neither in women ($p = 0.143$) nor in men ($p = 0.178$) did these differences in shooting success prove significant according to the Kruskal -Wallis test (Figure 7). In conclusion, the level of divided attention does not seem to significantly influence performance in basket shots regardless of the sex of the subjects studied.

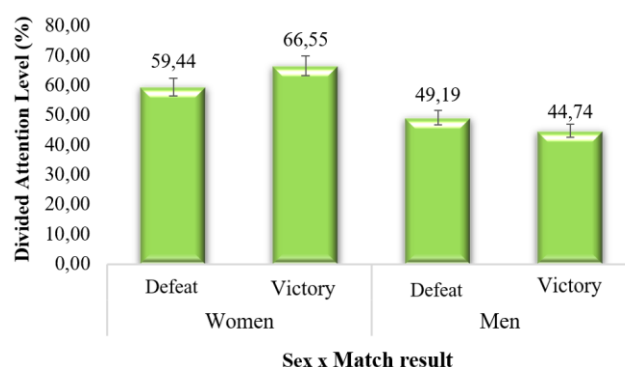


Figure 6. Divided attention level of subjects according to sex and match outcome.

Student's t (Women): $p = 0.486$ (no significant difference between the two mean levels of divided attention observed in women); Student's t (Men): $p = 0.521$ (no significant difference between the two mean levels of divided attention observed in men).

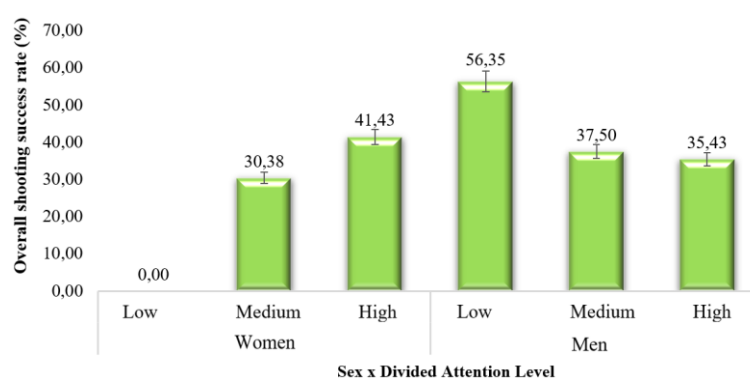


Figure 7. Overall success rate of basket shots based on gender and level of divided attention.

Kruskal-Wallis test (Women): $p = 0.143$ (no significant difference between the mean success rates of shots observed in women); Kruskal-Wallis test (Men): $p = 0.178$ (no significant difference between the mean success rates of shots observed in men).

3.1.3. Analysis of Technical-Tactical Performance as a Function of the Level of Divided Attention

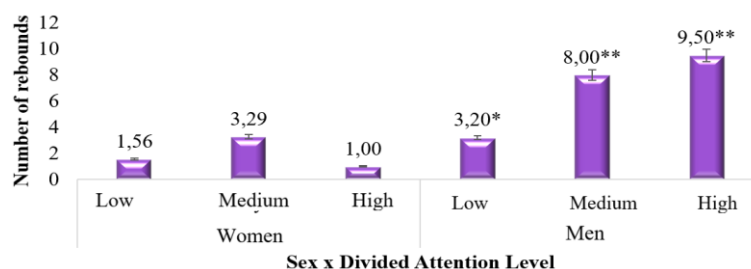


Figure 8. Number of rebounds performed according to sex and divided attention level.

Kruskal-Wallis test (Women): $p = 0.156$ (no significant difference between the mean numbers of rebounds observed in women);

Kruskal-Wallis test (Men): $p = 0.036^*$ (at least one of the mean numbers of rebounds observed differs significantly from the other two).

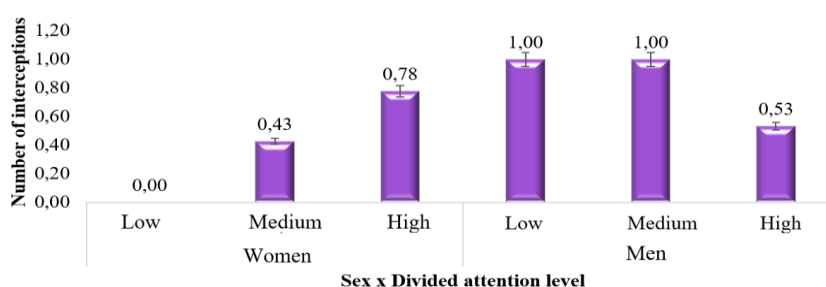


Figure 9. Number of interceptions performed according to sex and divided attention level.

Kruskal-Wallis test (Women): $p = 0.235$ (no significant difference between the mean numbers of interceptions observed in women);

Kruskal-Wallis test (Men): $p = 0.303$ (no significant difference between the mean numbers of interceptions observed in men).

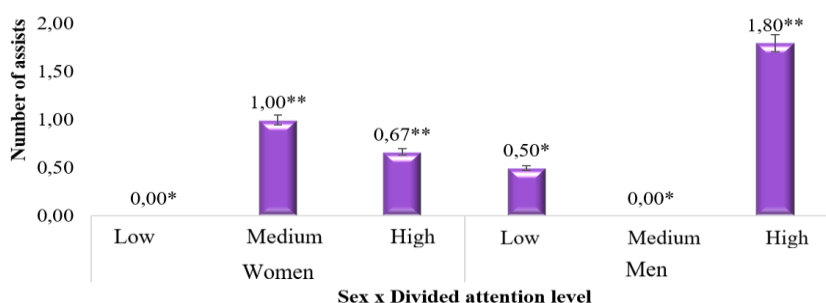


Figure 10. Number of assists made according to sex and divided attention level

Kruskal-Wallis test (Women): $p = 0.038^*$ (at least one of the mean numbers of assists observed among women differs significantly from the other two);

Kruskal-Wallis test (Men): $p = 0.021^*$ (at least one of the mean numbers of assists observed among men differs significantly from the other two).

Technical and tactical performances of the subjects are analyzed through three dimensions: rebounds, interceptions and assists. First, regarding the number of rebounds, the results do not indicate any significant variation in women according to divided attention ($p = 0.156$ in the Kruskal -Wallis test). Indeed, women achieve on average a slightly higher number of rebounds with average divided attention (3.29 ± 2.36) than with weakly (1.56 ± 1.51) or strongly divided attention (1.00 ± 1.41). On the other hand, in men, the number of rebounds increases significantly with the level of divided attention. Indeed, men

with strongly divided attention achieve on average 9.50 ± 6.36 rebounds compared to 3.20 ± 2.18 rebounds with weakly divided attention. Furthermore, this observed difference is found to be significant in the Kruskal -Wallis test ($p = 0.036$) (Figure 8). Then, regarding the number of interceptions, no significant difference is observed depending on attention, either in women (around 0.56 ± 0.92 interceptions on average) or in men (0.61 ± 0.78), and no statistically significant variation is highlighted ($p = 0.235$ and $p = 0.303$ respectively) with the Kruskal -Wallis test (Figure 9). Finally, regarding assists, we note a significant

influence of the level of divided attention in both sexes. In women, the average number of assists goes from 0 in weakly divided attention to 1.00 ± 1.15 in moderately divided attention, before falling back to 0.67 ± 1.12 in strongly divided attention. Furthermore, these variations are significant in the Kruskal -Wallis test ($p = 0.038$). Similarly, men make a higher number of assists in the highly divided attention group (1.80 ± 1.93) compared to the weakly divided attention groups (0.50 ± 0.71) and moderately divided attention groups (0.00 ± 0.00). This disparity is also significant in the Kruskal -Wallis test ($p = 0.021$) (Figure 10). In conclusion, more divided attention seems associated with better technical-tactical performances for certain game actions (notably rebounds and assists), especially among male players, while other aspects such as interceptions are not significantly affected by divided attention.

3.1.4. Analysis of Game Errors Based on the Level of Divided Attention

The subjects' playing errors were analyzed across two dimensions: ball losses and fouls committed. First, regarding ball losses, the results show that among women, the number of lost balls decreases on average with the increase in the level of divided attention. Indeed, on average 1.57 ± 1.72 ball losses were observed among women with weakly divided attention, 0.89 ± 0.78 among those with moderately divided attention and

0.00 among those with strongly divided attention. The observed differences are not statistically significant ($p = 0.211$) according to the Kruskal -Wallis test. In men, the group with weakly divided attention loses the ball more (3.00 ± 0.00) compared to the group with moderately divided attention (1.40 ± 1.24) and the group with highly divided attention (1.50 ± 0.71). In addition, the observed differences are statistically significant ($p = 0.020$) in the Kruskal -Wallis test (Figure 11). Then, regarding the fouls committed, no significant variation is observed in women ($p = 0.874$ in the Kruskal -Wallis test). Indeed, the number of fouls is respectively 1.00 ± 0.00 in those with weakly divided attention, 0.89 ± 1.05 in those with moderately divided attention and 0.86 ± 0.69 in those with highly divided attention. Conversely, men show a significant difference according to the level of divided attention ($p = 0.036$) in the Kruskal -Wallis test). Indeed, the average number of fouls committed reaches 4.00 ± 0.00 in men with a strong divided attention, against 2.00 ± 1.41 in those with a weak divided attention and 1.33 ± 1.11 in those with a medium divided attention (Figure 12). In conclusion, a lower level of divided attention in men is associated with more turnovers, while a higher level of attention corresponds to an increased number of fouls committed. On the other hand, in women, the level of divided attention does not seem to significantly influence game errors.

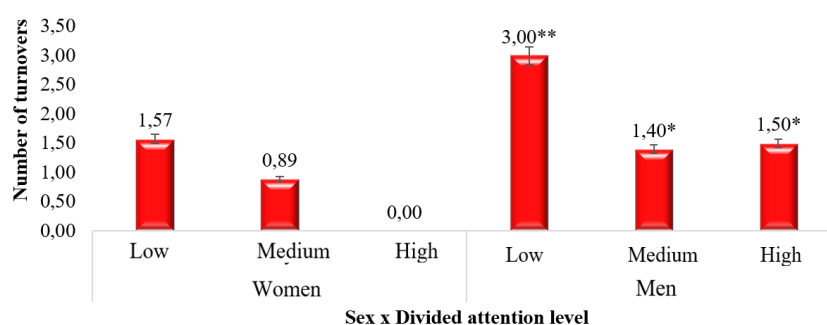


Figure 11. Number of turnovers according to sex and divided attention level.

Kruskal-Wallis test (Women): $p = 0.211$ (no significant difference between the mean numbers of assists observed in women);

Kruskal-Wallis test (Men): $p = 0.020^*$ (at least one of the mean numbers of assists observed in men differs significantly from the other two).

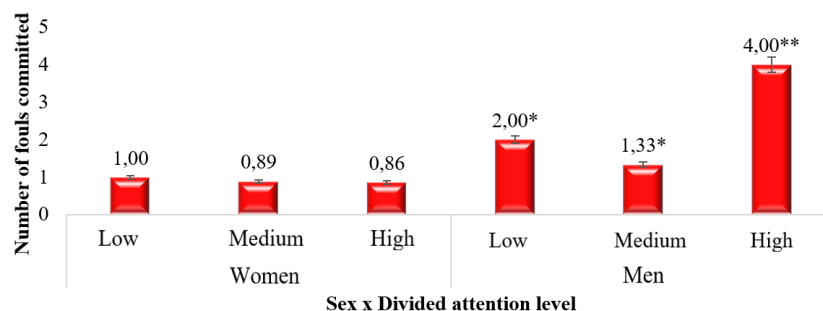


Figure 12. Number of fouls committed according to sex and divided attention level.

Kruskal-Wallis test (Women): $p = 0.874$ (no significant difference between the mean numbers of fouls committed observed in women);

Kruskal-Wallis test (Men): $p = 0.036^*$ (at least one of the mean numbers of fouls committed observed in men differs significantly from the other two).

3.2. Discussion

This study examines the role of divided attention in athletic performance among basketball players of both sexes from the Sports Association of the National Institute of Youth and Sports of Abidjan (AS INJS Abidjan). The discussion of the results obtained targets the four main aspects addressed: cognitive performance, shooting performance, technical-tactical performance and game errors.

3.2.1. Cognitive Performance by Sex

Results for the subjects' cognitive performance showed that women had higher visual accuracy and divided attention than men. However, memory accuracy did not show a significant difference between the sexes. This suggests that female athletes process and recall more visual information at the same time, compared to men.

Indeed, these differences can be explained on a neurophysiological level, by a better use of attentional and memory networks in women. Various studies in cognitive neuroscience indeed indicate a slight female superiority in tasks calling on episodic memory [17, 18] and multitasking, potentially due to particularities in interhemispheric brain connectivity or hormonal influences on cognition [19, 20]. For example, by observing the Ivorian basketball championship, female players regularly show great visual precision on the court [21, 22] and a better ability to manage several actions simultaneously [23], thus illustrating these cognitive gaps between the sexes.

Compared to scientific work, the observations of this work go against certain studies. On the one hand, Balogun and al. [24] found, from a neuropsychological test on young Nigerian footballers, that men have higher cognitive scores than women. This discrepancy can be explained by the nature of the tests used or by contextual sporting differences [25, 26]. On the other hand, at the international level, studies in sports neuroscience qualify the cognitive gaps between the sexes. For example, Legault and Faubert [27] report that while male athletes initially excel in a perceptual-cognitive task (tracking moving objects), intensive training particularly benefits women, which would reduce the gap and significantly improve the latter's attentional abilities. Thus, our results, in which women outperform men on certain cognitive functions, partially align with the idea that female athletes can mobilize neurocognitive resources as well, if not better, than their male peers, especially when the training environment stimulates these skills [28-30]. This highlights the importance of considering neurocognitive factors and gender in performance assessment, in line with recent trends in African and international literature.

3.2.2. Field Goal Shooting Performance as a Function of Divided Attention Level

Regarding field goal performance, the results indicate that

the level of divided attention does not vary significantly depending on the outcome of the match, whether in women or men. Furthermore, field goal success rates do not show any significant variation depending on the level of divided attention.

Divided attention is essential in sports such as basketball, where athletes must process multiple sources of information simultaneously. However, this study suggests that the level of divided attention does not appear to significantly influence shooting performance. This could be explained by the fact that basketball players, through their training, develop compensatory mechanisms that allow them to maintain stable performance despite variations in their level of attention [31, 32]. Indeed, the neuromotor loop involved in shooting (visuomotor coordination, cerebellum and basal ganglia) can operate almost automatically in expert players, which makes shooting performance relatively robust to variations in attentional availability [33]. In a match situation, we also observe that experienced players continue to score their baskets despite the noise of the crowd or defensive pressure (conditions which strongly require divided attention) thanks to the motor routine and targeted concentration developed during training.

These findings are partly consistent with some previous studies. At the local level, Adebayo [34] highlighted, among Nigerian basketball players, the importance of mental training combined with physical training to optimize performance. He recommends integrating cognitive exercises (attention, decision-making) into athletes' preparation, which suggests that better attention could theoretically improve gestural success in competition. At the international level, studies confirm that when an additional cognitive load is imposed on players, their technical performance decreases. For example, Cao and al. [35] show that mental fatigue (a state close to saturated attention) significantly deteriorates shooting skills (particularly free throws and three-pointers) and slows down decision-making in high-level basketball players. Similarly, dual-task experiments indicate that a shot performed while simultaneously juggling a cognitive task sees its success rate drop compared to a shot in normal conditions [36, 37]. The results of this work diverge in that no concrete effect of divided attention on skill is observed. This could be due to the nature of the measure used (intrinsic attentional capacities rather than concurrent dual-tasking during shooting) or to the level of automation already achieved by the subjects. In summary, although the literature indicates a link between cognitive overload and decreased motor performance, the data from the present study suggest that, given equal training, slight individual differences in divided attention do not significantly impair shooting accuracy.

3.2.3. Technical-Tactical Performance as a Function of the Level of Divided Attention

Regarding technical-tactical performance, the results reveal that certain technical-tactical skills in basketball are influ-

enced by the players' level of divided attention. Specifically, a high ability to divide attention is associated with better performance in actions such as rebounding and assisting. This effect is particularly observed in men, where those with highly divided attention capture on average more rebounds and deliver more assists than those with more limited attention. In women, the trend is similar for assisting (an intermediate level of attention being linked to the maximum number of successful passes), although less pronounced for rebounding. In contrast, interceptions do not seem to depend on attention, which suggests that this action calls upon reflexes or a different sense of anticipation.

In the neurocognitive field, these observations could be explained by the fact that players with better divided attention manage to process several sources of information simultaneously during the game, such as the trajectory of the ball and the positioning of teammates and opponents, and to adjust their actions in real time. Indeed, research shows that dual-task training improves attentional allocation and decision-making, while strengthening working memory and cognitive flexibility, executive functions essential for anticipating and reacting effectively during the game [38, 39]. For example, a point guard uses these skills to monitor each player's movements while dribbling, allowing them to make the decisive pass at the opportune moment [40]. Similarly, grabbing a rebound in basketball requires efficient divided attention, as the player must monitor the opponent's shot while quickly positioning themselves in front of other players [41, 42]. This ability to manage multiple sources of information simultaneously mobilizes the parietal cortex, involved in spatial integration and visuo-motor coordination, as well as motor circuits that allow instant adjustment of posture and movements [43, 44]. During matches, basketball players known for their game intelligence concretely illustrate the impact of high-performance divided attention on tactical success. These players combine panoramic court vision with precise technical execution, resulting in a high number of assists and rebounds on their match sheets [45, 38].

In the African context, this relationship between cognitive skills and technical-tactical success is supported by Adebayo [34] who highlights a positive association between intensive sporting engagement and cognitive functioning among elite basketball players in Nigeria, suggesting that a high level of practice is accompanied by better mental abilities and, therefore, increased effectiveness on the field. This finding is consistent with the idea that high-level sports training stimulates the executive functions (attention, anticipation) necessary for decisive tactical actions. At the international level, other studies confirm that the most successful players are distinguished by their cognitive qualities. For example, Vestberg and al. [46] demonstrate that among young elite footballers, scores on executive tests (working memory, cognitive flexibility, creativity) significantly predict the number of assists and goals scored subsequently. Clearly, athletes with a high-performing "game brain" make better

decisions and contribute more to winning team actions. Our results therefore fit into this trend. They suggest, in fact, that the advantage conferred by good divided attention on rebounds and passes comes from the fact that these actions require rapid simultaneous analysis of multiple pieces of information, a skill more highly possessed by players with a high neurocognitive profile. Conversely, the absence of an effect on interceptions could indicate, in light of the work of Scharfen & Memmert [47], that the latter depend mainly on specific vigilance or innate reaction skills that are not improved by divided attention. In any case, comparisons between our observations and African and international research support the idea that technical-tactical efficiency in sport is the result of an interaction between physical skills and neurocognitive resources.

3.2.4. Game Errors Depending on the Level of Divided Attention

Regarding game errors in basketball, the results indicate that men with lower divided attention commit more turnovers, while those with higher divided attention commit more personal fouls, likely due to a more aggressive and defensively involved style of play. In women, greater attention or concentration is generally associated with fewer game errors, although the differences are not significant.

Following a neurocognitive approach, these results suggest that game errors such as turnovers and fouls are influenced by cognitive and emotional factors. Indeed, low divided attention in men increases the probability of losing the ball, as it reduces the ability to efficiently process relevant information in game situations, which can lead to rushed decisions or technical oversights [35, 48]. Mental fatigue aggravates this phenomenon by decreasing the precision of movements and the quality of decision-making, thus making players more vulnerable to technical and strategic errors [35]. Furthermore, psychological stability, anxiety management and self-confidence play a key role. Indeed, an anxious or insecure player makes more errors compared to a confident and psychologically well-prepared player [48-50]. Negative emotions such as anger or embarrassment also increase the frequency of errors, while positive emotions such as happiness or excitement promote successful actions [51, 52].

The observations made in this study are in line with previous work in sports science, both locally and internationally. For example, Adebayo's [34] study on Nigerian basketball players highlights the importance of combining mental preparation and technical training to optimize performance and limit errors. This suggestion is consistent with the idea that cognitive training focused on attention and executive control can reduce turnovers. Internationally, other work confirms that mental fatigue and attentional limitations increase the number of errors during matches, with regard to turnovers and poor decisions [35, 52, 53]. However, integrating cognitive tasks into athletes' physical preparation improves attention, decision-making, and speed of execution, while reducing

technical and tactical errors. These benefits are attributed to better anticipation and increased activation of brain regions involved in attention and executive control [54-56]. In summary, the present study indicates that a good level of attention appears to be a protective factor against ball losses, even if its interaction with tactics can generate other types of errors depending on the context and the player's profile.

4. Conclusion

The aim of this study was to assess the influence of divided attention on the sports performance of basketball players from the Sports Association of the National Institute of Youth and Sports of Abidjan (AS INJS Abidjan). The results obtained show that divided attention plays a significant role in certain specific dimensions of technical and tactical performance, including rebounds and assists. In men, high divided attention is associated with better performance in these aspects of the game, but also with a significant number of fouls committed. On the other hand, no significant influence is observed on performance in shooting for the basket, thus highlighting the complexity of the interactions between cognitive functions and the different aspects of sports performance.

These observations confirm the importance of integrating cognitive training, particularly divided attention, into athlete preparation to optimize certain key skills for team sports such as basketball. Indeed, by improving their ability to simultaneously manage multiple visual and motor information, basketball players could reduce certain game errors such as turnovers and increase their efficiency in collaborative actions such as assists.

Finally, it would be relevant to expand on these findings with further research focused on the neurophysiological mechanisms underlying divided attention in team sport athletes. For example, studies using functional brain imaging (fMRI) or electroencephalography (EEG) could explore brain regions involved in attentional multitasking and identify specific neural correlates associated with athletic performance in the dynamic contexts of basketball. Similarly, studies examining the role of stress hormones, such as cortisol, and neurotransmitters involved in attention, such as dopamine and norepinephrine, could provide additional insights into attentional regulation in competitive athletes. Such research would contribute to a better understanding of the biological and cognitive underpinnings of divided attention and guide cognitive training methods to improve athletic performance.

Abbreviations

AS INJS	Sports Association of the INJS
fMRI	functional Magnetic Resonance Imaging
INJS	National Institute of Youth and Sports

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Author Contributions

Paterson Valery Disseka: Conceptualization, Methodology, Software, Formal analysis, Visualization, Writing – original draft, Writing – review & editing.

Emmanuel Diboh: Methodology, Validation.

Nientiah Ouattara: Investigation, Software, Data curation, Formal analysis.

Amon Devane Christ Axel Koumi: Investigation.

N'guessan Kouame: Conceptualization.

Leon Glin: Supervision.

Neme Antoine Tako: Project administration.

Conflicts of Interest

The authors declare no conflicts of interest.

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Research Field

Paterson Valery Disseka: Neurosciences, Animal Physiology, Biology and Health, Exercise Physiology, Physical and Sports Activity Sciences, Biostatistics.

Emmanuel Diboh: Neurosciences, Animal Physiology, Biology and Health.

Nientiah Ouattara: Neurosciences, Animal Physiology, Biology and Health.

Amon Devane Christ Axel Koumi: Neurosciences, Animal Physiology, Biology and Health.

N'guessan Kouame: Exercise Physiology, Physical and Sports Activity Sciences, Biomechanics.

Leon Glin: Neurosciences, Animal Physiology, Biology and Health.

Neme Antoine Tako: Neurosciences, Animal Physiology, Biology and Health.