



08037723307



agro-science@unn.edu.ng

# Agro-Science

Faculty of Agriculture, University of Nigeria, Nsukka

[Home](#)[About Us](#)[News](#)[Authors](#)[Reviewers](#)[Editors](#)[Readers](#)[Home](#) / [About the Journal](#)

## About the Journal

Journal of Tropical Agriculture, Food, Environment and Extension.

### Overview and Scope

Agro-Science, the journal of the Faculty of Agriculture of the University of Nigeria, was borne out of the need for a forum and technical mouthpiece for the communication and extension of scientific and agricultural research in Africa and countries in the rest of the tropical region of the world. Agro-Science is an international journal of high technical/intellectual quality, published four times a year (January, April, July and October). It is tropical in scope and has the following areas of focus: Soils and the Environment, Crop Science, Agronomy, Animal Science; Aquaculture & Fisheries, Post-Harvest Technology, Food Science & Technology, Home Science &



### Recent Posts

[→ Hello world!](#)

### Recent Comments

[→ A WordPress Commenter on Hello world!](#)

### Archives

[→ November 2019](#)

Management, Nutrition & Dietetics, Agricultural Engineering & Mechanization, Agricultural Economics, and Agricultural Extension.

#### EDITORIAL BOARD

Prof. M.I. Uguru	Editor-in-Chief
Prof. (Mrs.) Ngozi Nnam	Associate Editor-in-Chief
Prof. A.O. Ani	Business Manager
Dr. Sunday E. Obalum	Secretary

#### ASSOCIATE EDITORS

Prof. K.P. Baiyeri	(Nigeria)
Prof. S.O.C. Ugwu	(Nigeria)
Prof. Iro Nkama	(Nigeria)
Prof. C.J. Arene	(Nigeria)
Dr. (Mrs.) J.M. Chah	(Nigeria)
Dr. Muhammad Valipur	(Iran)
Prof. W.I. Okonkwo	(Nigeria)
Prof. C.O. Muoneke	(Nigeria)
Prof. A.M. Oparaeke	(Nigeria)
Prof. P.E. Odo	(Nigeria)
Dr. Omkar Singh Kuchwaha	(India)

### Categories

→ [Uncategorized](#)

### Meta

→ [Log in](#)

→ [Entries RSS](#)

→ [Comments RSS](#)

→ [WordPress.org](#)



## Authors

### Author Login

[Submit Manuscript](#)

[Guide For Authors](#)

[Publishing Ethics](#)

[Tack your Papers](#)

## Reviewers

### Reviewer Login

[Reviewer Guidelines](#)

[Reviewer Signup](#)

[Reviewer Recognition](#)

[Manage Reviewer](#)

## Editors

### Editor Login

[Register Users](#)

[Manage Users](#)

[Center](#)

## Contact Us

Agro-Science is available at AJOL website Website: [www.agrosciencejournal.com](http://www.agrosciencejournal.com)

ISSN 1119 -7455 © 2019 Faculty of Agriculture, University of Nigeria, Nsukka, Nigeria

Copyright © All rights reserved.

Powered by Publishing Realtime | Design by Wizzyhub Tech Ltd



[Home](#)[Current](#)[Archives](#)[About ▾](#)

*Agro-Science*, the journal of the Faculty of Agriculture of the University of Nigeria, was borne out of the need for a forum and technical mouthpiece for the communication and extension of scientific and agricultural research in Africa and countries in the rest of the tropical region of the world. *Agro-Science* is an international journal of high technical/intellectual quality, published four times a year (January, April, July and October). It is tropical in scope and has the following areas of focus: Crop Science; Animal Science; Animal Health; Soil and Environment, Agricultural Economics, Agricultural Extension, Home Economics, Food and Nutrition; Post-harvest Technology; Agricultural Engineering and Mechanization.

Other websites related to this journal: <http://www.agrosciencejournal.com/>

## Current Issue

Vol. 20 No. 3 (2021)

## Articles

**Growth of small and medium-sized agricultural enterprises and export market integration by smallholder farmers**

V.K. Dagbelou , S.A. Adekambi , J.A. Yabi

1-8

DOI: [10.4314/as.v20i3.1](https://doi.org/10.4314/as.v20i3.1)



### **Impact of information on secondary school students' knowledge, perception and attitude towards agricultural career in Ogun State, Nigeria**

O.B. Osuntade, D.A. Babalola, O. Ogunseitan

9-13

DOI: [10.4314/as.v20i3.2](https://doi.org/10.4314/as.v20i3.2)



### **Characterization, classification and suitability evaluation of soils under sugarcane (*Saccharum officinarum L.*) cultivation at the Sugar Research Farm, University of Ilorin, Nigeria**

O.N. Ajala , T.A. Adjadeh , J.O. Olaniyan , T.O. Isimikalu , E.K. Nartey , F.O. James

14-23

DOI: [10.4314/as.v20i3.3](https://doi.org/10.4314/as.v20i3.3)



### **The effect of mechanization on labour employment and cropland expansion in northern Nigeria**

B.B. Shani , A. Musa

24-29

DOI: [10.4314/as.v20i3.4](https://doi.org/10.4314/as.v20i3.4)



### **Production and evaluation of breakfast meal using blends of sorghum, bambara nut and date palm fruit flour**

T.O. Olurin , E.S. Abbo , O.F. Oladiboye

30-36

DOI: [10.4314/as.v20i3.5](https://doi.org/10.4314/as.v20i3.5)



### **Influence of slope aspect and position on soil physical quality and management implications at University of Uyo Teaching and Research Farm, Akwa Ibom State, Nigeria**

P.I. Ogban

37-48

DOI: [10.4314/as.v20i3.6](https://doi.org/10.4314/as.v20i3.6)



### **Contribution of snail production to income status of snail farmers in Edo South, Edo State, Nigeria**

J. Ahmadu , E.O. Ida-Ogbomo , D.E. Oyoboh

49-52

DOI: [10.4314/as.v20i3.7](https://doi.org/10.4314/as.v20i3.7)



### **Utilizing urban refuse wastes as soil amendment in sub-Saharan Africa: Prospects and challenges in the Nigerian context**

A.B. Alhassan , A.M. Chiroma , A.M. Kundiri , B. Bababe , I.J. Tekwa

53-64

DOI: [10.4314/as.v20i3.8](https://doi.org/10.4314/as.v20i3.8)



### **Exploring integrated pest management strategies in the control of the fall armyworm in smallholder organic agriculture farms in Africa**

A.O. Akinyemi

65-70

DOI: [10.4314/as.v20i3.9](https://doi.org/10.4314/as.v20i3.9)



### **Output response at the farm level: Maize supply and input demand in Kaduna State, Nigeria**

J.R. Mani , Z. Abdussalam , M.A. Damisa

71-79

DOI: [10.4314/as.v20i3.10](https://doi.org/10.4314/as.v20i3.10)



### **Bio-enhanced removal of hydrocarbon contents from spent engine oil contaminated soil using *Staphylococcus aureus* and *Bacillus cereus* co-culture**

A.O. Adeleye , M.B. Yerima , M.E. Nkereuwem , V.O. Onokebhagbe , I.S. Sadiq , A.O. Amoo , G.B. Bate , G.P. Shiaka , M. Raji

80-90

DOI: [10.4314/as.v20i3.11](https://doi.org/10.4314/as.v20i3.11)



### **Effect of a communication programme on dietary behaviour of Beninese female handball players**

S.M. Kiki , I. Bio-Nigan , B.A. Tonon , G. Gouthon , P. Gouthon , C. Quenum

91-98

DOI: [10.4314/as.v20i3.12](https://doi.org/10.4314/as.v20i3.12)



## Heavy metals in shell fishes of Ojo River, Lagos State, Nigeria

R.Y. Oladunjoye , O.O. Fafioye , S.T. Bankole , A.H. Adedeji , A.S. Edoh

99-103

DOI: [10.4314/as.v20i3.13](https://doi.org/10.4314/as.v20i3.13)



## Erodibility of soils of varying land utilization types and lithologic materials in central southeastern Nigeria

C.M. Ahukaemere , E.U. Onweremadu , F.O.R. Akamigbo

104-109

DOI: [10.4314/as.v20i3.14](https://doi.org/10.4314/as.v20i3.14)



## Short Communication

### Relationships between body weight and some linear morphometric traits in Nigerian Nsukka ecotype local hens

N.E. Ikeh , O.R. Okwesili

110-113

DOI: [10.4314/as.v20i3.15](https://doi.org/10.4314/as.v20i3.15)



[View All Issues](#) >

## Journal Identifiers

eISSN: 1119-7455



### HOW TO USE AJOL:

- [for Researchers](#)
- [for Librarians](#)
- [for Authors](#)
- [FAQ's](#)

## EFFECT OF A COMMUNICATION PROGRAMME ON DIETARY BEHAVIOUR OF BENINESE FEMALE HANDBALL PLAYERS

\*Kiki S.M., Bio-Nigan I., Tonon B.A., Gouthon G., Gouthon P. and Quenum C.

Sport, Health and Evaluation Research Unit (UR/SSE),  
National Institute of Youth, Physical Education & Sport (INJEPS),  
University of Abomey-Calavi, Porto-Novo, Republic of Benin

\*Corresponding author's email: [sidoniekiki@gmail.com](mailto:sidoniekiki@gmail.com)

### ABSTRACT

*Dietary behaviour in humans is often influenced by intrinsic and extrinsic factors. During training camps, elite female handball players from different parts of the country are subjected to the same diet. The objective of the study was to determine the effect of a communication programme proposed in 2019, to the cadet and junior female handball players, on their dietary behaviour in Benin. This is an intervention study, with 36 cadet and junior female handball players selected to participate in the two training camps in 2019. Data on the physiological, social, cultural and psychological determinants of eating behaviour were collected through observation and questionnaire, as appropriate, before and after the intervention. Descriptive statistics were used to analyze the data and McNemar's test was used to analyze the contingency tables. Fifteen players significantly improved their eating behaviour from zero at baseline to good ( $p = 0.0001$ ). The physiological, social, cultural and psychological determinants of eating behaviour were all improved at  $p = 0.0001$ . The proposed communication programme induced a significant improvement in the eating behaviour of the handball female players studied. Nutrition education sessions and the integration of the players' food preferences into diets may have a more significant impact in a future study.*

**Key words:** eating habits, handball, nutrition education, behaviour change communication, Benin

### INTRODUCTION

Eating behaviour is defined as a set of simple habits, rules and norms constructed over time by individuals or social groups in relation to food (Etiévant *et al.*, 2010; Olarewaju *et al.*, 2020). It conveys social, mental and cultural representations that normally evolve over time, according to lifestyles (Ono *et al.*, 2012). Because of its complexity, eating behaviour is not easy to change, but changes must be made when it tends to cause nutrition-related diseases (WHO, 2018; Okugn and Woldeyohannes, 2018) which are also detrimental to sport performance (Joy *et al.*, 2016). It is therefore necessary for athletes, who are an integral part of the society, to adopt good dietary behaviour throughout their careers, at home, during training camps and during competitions. In contexts, proposed diets must take into account the individual preferences of athletes and the characteristics of their family environment (Palomares, 2000).

The application of such diets would optimize the effects of the nutritional factors of sports performance (Sas-Nowosielskir and Wycislik, 2019), since during the regular phase of the sports season, female handball players, particularly those from Benin, live with their respective families and train in clubs only between 8 and 10 h per week (Gouthon *et al.*, 2015; Nouatin *et al.*, 2015; Linta *et al.*, 2020). However, as competitions approach, these players

from different social backgrounds are grouped together in two-week training camps (CE) and are subjected to intensive training of two sessions per day, followed by the same diet. The dynamics of the training camp group are thus likely to lead to a change in eating behaviour, i.e., the occurrence of new behaviours that may be favorable or harmful to the nutritional profile (Kelly and Barker, 2016). The same is true for the performance of female players (Nhantumbo *et al.*, 2013), as long as diet is a determining factor in performance in sports (Cornil *et al.*, 2020), particularly in handball, due to the high energy demand of match action (Saavedra, 2018).

Diversification of meals, as well as consuming them under healthy eating conditions recommended by official structures (Ejemot-Nwadiaro, 2015, Gacek, 2015), are therefore necessary to optimize their effects. For this reason, the eating behaviour of the players must be periodically evaluated to assess the gaps in terms of insufficiency and, if necessary, propose a strategy for adjustment or change. When considered, a communication-based intervention for changing the eating behaviour of athletes should have two objectives. The first objective is to contribute to the prevention of eating errors and eating disorders that are detrimental to the performance and health of athletes. The second objective is to rationalize eating patterns in order to sustain the positive changes achieved (Kenefick, 2018; Casa *et al.*, 2019).

A few authors have studied aspects such as the influence of commensality on diet (La Bounty *et al.*, 2011) and meal frequency (Herman, 2017) in a disparate manner. At the African continental level and more specifically in Calanza, Mozambique, the study revealed that poor nutrition negatively influenced the sports performance of children aged 6 to 17 years (Nhantumbo *et al.*, 2013). In Benin, work aimed at taking stock of the country's sports performance at different times since its independence in 1960 led to suggestions for improving sports management in the country and the physical capacities of athletes (Gouda and Kpazaï, 2012; Tonon *et al.*, 2012; Gouthon *et al.*, 2015; Nouatin *et al.*, 2015; Linta *et al.*, 2020). The behaviour of the female handball players who are the subject of the present study is identical to that of their non-sporting peers, when they live and eat in families, so that it is often difficult for them to adapt to the demands of meals during training camps. Therefore, an intervention is necessary to improve their level of adaptation and, consequently, their eating behaviour during training camps. That is why, this study was undertaken to measure the impact of a communication programme on the eating behavior of junior female handball players in Benin during training camps in preparation for the 2019 Continental Challenge Trophy.

## MATERIALS AND METHODS

It was an uncontrolled intervention study, carried out with the female handball players of the Benin cadet and junior national selection, during two training camps of five days each, preparatory to the continental tournament of the Challenge Trophy of the year 2019. A first data collection on the players' eating behaviour was carried out during the five days of the first camp, as a diagnostic evaluation. During the last 24 h of the camp, the players attended the first session of the communication programme. After seven days of rest and just after their arrival at the second training camp, the players were again given the second session of the communication programme for another 24 h, followed by the second collection of the same data during the five days of the new camp (Table 4).

Moreover, since it was difficult to separate the communication programme from the actions of the restorers and the Executive Committee of the Beninese Federation of Handball (BFH), sensitization and advocacy were carried out respectively towards these two actors, with a view to achieving results. Indeed, it was necessary to sensitize the restaurant owners by a communication on the respect of the execution of the proposed menu and then, the members of the Executive Committee of the Beninese Federation of Handball regarding the adequate financial contribution to better feed the players (Table 5).

The authorization of the Sectoral Scientific Committee of Sciences and Techniques of Physical, Sports and Socio-Educational Activities of the University of Abomey-Calavi was required. All the female handball players were informed of the objectives of the study before giving their free, informed and written consent to participate. They were assured that the results would be anonymously and confidentially used and that the interviews would be destroyed no later than 12 months after their use.

The study sample consisted of 17 cadets aged 13-16 years and 19 juniors aged 17-19 years giving a total of 36 female handball players, all members of the Republic of Benin national team. They were all selected to participate in the qualification tournament of the Challenge Trophy of Niamey in Niger Republic in 2019. Two survey techniques were used. These were direct observation of the eating behaviour of the female handball players, followed by a questionnaire survey. The direct observation technique was used to assess the physiological (except satiation), social and cultural determinants of the eating behaviour of the female handball players. The observation grid consisted of 61 items organized according to four dimensions. Apart from the socio-demographic data, the physiological determinant consisted of nine items, the social determinant consisted of 16 items and the cultural determinant consisted of 36 items.

The 10-item self-administered questionnaire was used to collect data on the psychological determinant with nine items, plus one aspect of the physiological determinant (the state of satiation) that were not directly observable. The sensitivity of the observation grid and questionnaire was assessed in a pre-test with 10 junior female handball players who were not part of the study sample. The two questions in the questionnaire, which were not clearly understandable, were reworded, before test. The content and structure of the tools were validated by the Human and Social Sciences expert researchers of magisterial rank from the University of Abomey-Calavi. The eating behaviour of the handball players was assessed through the four composite variables: physiological, social, cultural and psychological determinants.

The physiological determinant consisted of four sub-variables including the feeling of hunger, whether or not the meal was eaten, the state of satiation and the composition of the meal. The feeling of hunger was determined by the presence of the player in the dining hall at mealtime, while the consumption of meal was noted by the effectiveness of the eating act. The state of satiation was as provided by the players in their declaration. The composition of the meal was determined on the basis of the number of food groups present in the eight commonly selected groups of food (AFSSA, 2000), in addition to beverages. These are:

cereals/legume/tubers, sugar/sugar products, raw or cooked vegetables, raw or cooked fruit, fish/meat/eggs, dairy/milk products, vegetable fats, and animal fats; a list of food groups excluding with water and sweetened beverages.

The social determinant included commensality, timing, type, duration, frequency and structure of meals. These sub-variables were made operational in two or three modalities as appropriate. Commensality was reflected in the consumption of meals alone or in groups, meal schedules could be fixed or not, and the type of meal was classified as local, western or mixed. The meal was said to be local when it had been prepared using locally sourced foods traditionally. It was considered western when it was made with western foods and then prepared in a western (non-African) manner. It was mixed when it presented one or the other aspect of a local and western meal. The length of the meal indicated the time spent eating it. Meal frequency could vary from one to three (breakfast and/or lunch and/or dinner). The structure of the meals was assessed based on the number of dishes in each meal. It could vary from one to three, including a single course, two, or three courses (starter, main course and/or dessert). The cultural determinant included the following four aspects: food prohibitions, the posture adopted during the meal, the use or not of cutlery and the respect of hygiene rules during the eating act (washing hands before and after the meal, means of washing, drying hands and means of drying). The psychological determinant brought together three aspects: the presentation of the meal (color, arrangement or layout of the food in the tray), the aroma and then the taste of the meals.

Eating behaviour was considered as a composite dichotomous variable, i.e., with two modalities, Good or Bad. It was made up of four sub-variables or dimensions, namely the psychological, social, cultural and psychological determinants of eating behaviour. In order for a player's eating behaviour to be considered Good, all four determinants had to be assessed as Good. Each determinant was assessed as good in a player if at least 80% of the items comprising it were satisfactory.

All data from direct observation and the questionnaire survey were processed using SPSS software (IBM, USA, version 22.0). The number of staff by modality (good or bad) was inserted in the contingency table and only those who underwent a change as a result of the intervention itself were considered. This approach was implemented first for dietary behaviour and then for all four determinants of dietary behaviour. Afterwards, McNemar's test was conducted using the discordant values, i.e., those that showed changes at the end of the intervention. The significance level of the statistical tests was set at  $p < 0.05$ .

## RESULTS

### Socio-Demographic, Anthropometric and Sport Practice Characteristics of the Players

The female handball players studied had an average age of  $17.0 \pm 1.6$  years, an average body weight of  $59.2 \pm 6.4$  kg and an average height of  $162.8 \pm 0.7$  cm. Among them, 17 (42.2%) were under 17 years of age. Four of the players had elementary school education, while the rest of the group had at least secondary school education. The female handball players came from the three regions of the country: northern, central, and southern Benin. Of the 36 female handball players, 12 (33.3%) were in their first national selection (Table 1). There was no significant difference in data processing between those under 17 years of age (cadets) and those between 17 and 20 years of age (juniors). For this reason, the results were confounded for the two categories.

### Changes in Eating Behaviour

Prior to the communication programme, all the 36 female handball players studied had poor eating behaviour (Table 2). At the end of the programme, 15 or 41.7% of the participants, had good behaviour, the difference being significant at  $p = 0.0001$ .

### Changes in the Determinants of Eating Behaviour Observational data: physiological, social and cultural determinants

At the end of the first training camp (Table 3), the number of female handball players who performed well for the physiological determinant was 36 versus 8 ( $p = 0.0001$ ) at the beginning, for the social determinant 36 versus 18 ( $p = 0.0001$ ) and for the cultural determinant 9 versus 0 ( $p = 0.0001$ ).

### Data from questionnaire survey: psychological determinant

On psychological determinant (Table 4), the number of players with good behaviour improved by 8 to 15 ( $p = 0.0001$ ) between the start and end of the communication programme.

**Table 1:** Socio-demographic, anthropometric and sport participation characteristics of the female handball players studied (number of players studied,  $n = 36$ )

Variables (units)	Mean $\pm$ standard deviation
Age (years)	$17.0 \pm 1.6$
Size (cm)	$162.9 \pm 7.2$
Body mass (kg)	$59.2 \pm 6.4$
Body mass index ( $\text{kg}/\text{m}^2$ )	$22.3 \pm 1.6$
Daily hourly training mass (H)	$5.0 \pm 0.0$
Seniority in practice (years)	$1.7 \pm 0.6$

**Table 2:** Changes in eating behaviour induced by the communication programme in the female handball players studied ( number of players studied,  $n = 36$ )

		After intervention		$\chi^2$ of Mc Nemar	$p$
		Good	Bad		
Before intervention	Good	00	00	15	0.0001
	Bad	15	21		

**Table 3:** Changes in the determinants of dietary behaviour induced by the communication programme for the female handball players studied (number of players studied,  $n = 36$ )

	Déterminants		Measures 2		$\chi^2$ of McNemar	$p$
			Good	Bad		
Measures 1	Physiological	Good	08	00	28	0.0001
		Bad	28	00		
	Social	Good	18	00	18	0.0001
		Bad	18	00		
	Cultural	Good	00	00	9	0.0001
		Bad	09	27		
Psychological	Good	08	00	7	0.0001	
	Bad	07	21			

Measures 1: before the communication programme; Measures 2: after the communication programme;  
 Good: number of female players with good behaviour; Bad: number of female players with bad behaviour

**Table 4:** Female Handball Communication Programme adapted from the Prochaska and Di Clémente's (1983) Model

First Camp	First Session	Steps (objective)	Time: Duration	Tasks	After the 1 <sup>st</sup> camp
Last day of the first training camp	Sequence 1	Diagnostic evaluation	Night of the first day on arrival (60 min.)	NB: in addition to the oral communication procedures below, written messages were transferred by telephone to the players morning, noon and evening on the consequences of poor eating behaviour on the same topics.  Inform the female players about the communication process for changing eating behaviour. Assess their level of knowledge about the determinants of eating behaviour, in particular: - the food groups that are essential for a balanced diet - the need not to skip meals - the importance of water at the table for athletes - hand hygiene before and after meals - the importance of eating in a group Make female handball players aware of the need to change their eating behaviour.	
	Sequence 2	Pre-contemplation (Information)	Before Breakfast (30 min.)	On the first night of the training camp, it was necessary to see, together with the players, if: - they always eat when they are hungry, - the meal is served on time, - the quantity served is sufficient, - the meal is well presented, tastes and smells good, - the means are gathered to ensure good hand hygiene before and after the meal, - they love every meal served.	
	Sequence 3	Contemplation (Awareness)	After morning training (60 min.)	Poor eating behaviours have adverse consequences on health and athletic performance. - Do not eat when hungry, ends up perforating the intestine. - Refusal to eat in the dining hall, starves and weakens. - Eating too quickly makes digestion difficult. - Failure to wash hands before eating can cause gastro enteritis or diarrhea that is detrimental to athletic performance. - Avoid eating certain foods during meals, unbalances the diet and makes you vulnerable to disease. - Not taking the time to observe and enjoy a meal can lead to a lack of appetite.	-Post-training camp monitoring and evaluation -Promoting maintenance of good behaviour through written messages sent by telephone
	Sequence 4	Preparation (Motivation)	After lunch (60 min.)	Performance depends on physical, physiological, technical-tactical, mental, etc. factors, the effectiveness of which is conditioned by good eating behaviour: - Diet is the first determinant of health - Good health depends on good eating behaviour - Good eating behaviour is the result of an awareness, willingness and decision to engage in the process of changing bad eating habits	
	Sequence 5	Action (Modification)	After evening training (90 min.)	- Identify bad individual acts that can lead to poor health and poor athletic performance. - Start changing bad manners in a radical way. - Practical hand washing exercise in 30 s per female player	
	Sequence 6	Maintenance (Preservation of assets)	Twice a week (30 min.)	Sending written messages over the phone reminding people of the dangers of poor eating behaviour on health and athletic performance Seven-day rest	
2 <sup>nd</sup> Camp	2 <sup>nd</sup> Session	Theme	Time: Duration	Tasks	After the 2 <sup>nd</sup> camp
First day of the 2nd training camp			Same as at the first camp		

**Table 5:** Intervention content for restaurateurs and members of Beninese Federation of Handball (HFB)

Intervention toward the other actors	Outreach to women conservators		Advocacy towards the Executive Committee of Beninese Federation of Handball
	Sequence 1	Sequence 2	
Sessions (duration)	1st day of rest for female handball players (120 min.)	4 days before the 2 <sup>nd</sup> camp (75 min.)	3rd day of rest for the female handball players: meeting obtained by appointment (90 min.)
Themes of the communication	-Accessibility and availability of meals at fixed times		-Revision of the feeding programme for female handball players in relation to the dietary requirements.
	-Food hygiene (in the choice, preservation, preparation of food)		- Improvement of the budget allocated to the catering of the female handball players to increase the quality and quantity of the meals.
	-Availability of hand washing devices for good hand hygiene at meals		-for the quantity, bring more vegetables, cereals, tubers and legumes.
	-Need to introduce the eight food groups into the players' lunch and dinner each day	Same	-for quality, introduce fruit, dairy products, butter, water and require that all food groups be introduced in the lunch and dinner meals
	-Setting up an attractive and appetizing buffet		-Availability of hand washing kits for good hand hygiene at meals (device, soap, and individual disposable towels)
	-Need to serve meals in sufficient quantity to the players		- Political and administrative decisions that promote the adoption and maintenance of good behaviour among female handball players: memos, circulars or decrees to formalize decisions
			- Possible social actions to help female handball players adopt and maintain good eating habits: financial support.

## DISCUSSION

The objective of this study was to determine the effect of a communication programme on the dietary behaviour of Benin's elite cadet and junior female handball players during training camps in 2019. The results obtained from this study are reliable because they highlighted the actual dietary behaviour of the players under real conditions of intensive training in preparation for a continental competition. Considering the importance of the stake, the Handball Federation of Benin had implemented all the means to improve the performance of the players before the Challenge Trophy.

The selection of the handball players was done on the whole Beninese territory in order to respect a good representativeness. The players came from different regions and therefore had different cultures. This diversity of cultures could have been an asset in other situations but are limiting factors in preparation of a continental level competition. These limits are especially observable on food plan since the female handball players do not have habits and behaviours in relation to food. The regrouping was necessary to facilitate the cohesion of the selection, to ensure at least three meals per day to each of them because of the physical and physiological requirements of the trainings, to constitute a homogeneous group.

The Beninese selection met the international standards in terms of age (IHF, 2018). However, in terms of BMI, body mass and height, these anthropometric characteristics of the cadets were lower than those of their international counterparts, whose values were defined above theirs in a systematic review of 38 articles (Martínez-Rodríguez *et al.*, 2020). This observed deficiency in the anthropometric characteristics of cadets could disadvantage them during competition.

In this clustering context, it would have been risky to create a control group that would not have benefited from the communication programme. This was why all the players participated in this programme aimed at improving their eating behaviour, with a view to contributing to the optimization of all the factors that could contribute to the team's good performance. Thus, all the athletes were followed by direct observation during the three daily meals served during the two training camps. The observation made it possible to determine the recurrences of the eating behaviour of the studied female handball players.

This study revealed that initially these female players generally had poor eating behaviour. This behaviour was strongly influenced by poor cultural and psychological determinants, through poor hand hygiene and lack of taste, as well as inadequate pre-intervention meals. Indeed, the female players did not systematically wash their hands before and after meals. They also did not wipe their hands dry after did washed them. This lack of hygiene could expose female handball players to the risk of nutrition-related communicable diseases (WHO and FAO, 2003), which can impair both their health and athletic performance (Nhantumbo *et al.*, 2013).

Moreover, in African culture, including that of Benin, eating by hand is very common and is strongly associated with the hedonic nature of meals. Sometimes, even when using cutlery, the individual does not hesitate to plunge his hand into the plate to take a piece of meat that the fork cannot prick, because of the bone, and then, afterwards, licks the fingers. This situation was accentuated during the present study by the fact that the knives were not part of the cutlery made available to the players. As a result, many players experienced the need to use their fingers to grasp a piece of food at some point during the meal. It is therefore essential

to wash their hands with soap and water before sitting down to eat, whether or not they have cutlery (Ejemot-Nwadiaro *et al.*, 2015). The poor hand hygiene practice observed among most elite female handball players in Benin before the intervention may be partly the result of inadequate hand washing facilities (only one facility for all the 36 players before and after meals) and the lack of soap. This result is similar to that found in the general population, particularly among members of households surveyed in Abobo District in Ethiopia, where 49% of the subjects studied had poor food hygiene practices associated with poor hand washing device (Okugn and Woldeyohannes, 2018).

The psychological determinant is an important aspect of female handballers' eating behaviour, as it facilitates consumption of food by activating the appetite through the quality of presentation, aroma, and taste of food (Menzel *et al.*, 2019). The psychological determinant highlights the role of the sensory properties (visual and olfactory) of food in the modulation of behaviour before consumption or palatability during the eating act (Nicklaus and Boumez, 2016). A meal that is not well presented or does not have an appetizing aroma, even if it is succulent, may not attract the consumer. In Nigeria, preference for rice consumption is a function of taste and quality among other factors (Nwachukwu and Achike, 2020). Thus, at the first training camp, according to the players, the meals were generally not well presented and were not sufficient. Being subjected to a unique diet with no other alternative, they therefore felt the need to eat despite their reluctance, with insufficient food being served to meet their energy needs. These results therefore require intervention to assess the changes.

The intervention programme, based on awareness sessions, improved the physiological and social determinants in all players. At the second training camp, after the intervention, the players reported having eaten their fill with appetite. This can be explained by the significant improvement in the hedonic aspect of meals, i.e. taste, aroma and presentation. This change was itself favored by the improvement in the composition of the meals and an increase in their quantity obtained through the sensitization of the restaurateurs and advocacy with the BHF. It was indeed difficult to separate the communication programme aimed at improving the behaviour of female handball players from the sensitization of the restaurant owners who were responsible for the meals consumed by the players and advocacy with the BHF which is responsible for financing and organizing these training camps. All these interventions had borne fruit because, at the first camp, the female handball players were generally served only one main course, without water to drink at the table. In the second camp, on the other hand, they were served at least one main course (main dish), a dessert (raw fruit) and water at each main meal, i.e., lunch and dinner.

After the intervention, significant good eating behaviour was observed in nearly half of the female handball players, due to the culinary improvements. This change obtained over a 12-day period from the end of the first camp to the end of the second, made it possible to say that a repetition of such communication programme could have greater positive effects for the players, if a decision were made to do so. However, the lack of availability of the players did not allow an intervention longer than the 48 h that was stipulated in the research protocol. It is hoped that the good behaviour observed in the 15 gamblers will continue in their families and in their daily lives. It is also desirable that their good behaviour influence that of their peers and their entire immediate environment.

For a sustainable change in eating behaviour in female handball players, it is recommended that the different determinants studied be taken into account through family, school and social education. If the right gestures and behaviours are adopted systematically and regularly within the family, the players will be able to apply them effortlessly everywhere, even in training camps, since it has been proven that their age ( $17.0 \pm 1.6$  years) is strongly associated with the formation of their identity (Abd El-Shaheed *et al.*, 2019). School education also has a fundamental role to play, as rules of hygiene and good conduct must be also taught at school. However, there is no official school food policy regulated by authorities in charge of education (Nago *et al.*, 2012). Thus, the time devoted to this training in school is insufficient (less than 120 minutes per week) to have a significant impact on students' behaviour.

The suggestion made here is to increase the amount of time devoted to this topic in schools, based on the idea that the school environment contributes to building good eating behaviour over time (Costa *et al.*, 2010). Trainers/teachers should also devote time to coaching athletes on different aspects of the determinants of eating behaviour. This will ensure that good eating behaviours are sustained over time for players, whether they are in the school, family or sport environment. It is therefore essential to train the trainers in the adoption of good eating behaviour in order to influence the athletes in their way of doing things.

## CONCLUSION

The hypothesis of the study was that a communication programme could have a positive effect on the eating behaviour of Benin's national elite female cadet and junior handball players during training camps in preparation for the 2019 continental Challenge Trophy tournament. Prior to the communication programme, all the female handball players studied had poor eating behaviour. After the communication programme, almost half of the players were able to improve their eating

behaviour which became good. The proposed communication programme thus had a positive effect on the female players' eating behaviour. Therefore, the initial hypothesis was confirmed. The objective was also partially achieved, since more than half of the gamblers still had poor eating behaviour. The study highlighted the need to broaden the scope of intervention to all categories of handball players from Benin's national elite. The five aspects that significantly influenced the eating behaviour of the female handball players during the experimental training camps were presentation, aroma, taste of meals (psychological aspect), state of satiation (physiological aspect) and respect of hygiene rules during meals (cultural aspect). Therefore, it is necessary that other studies look at longer programme duration, while emphasizing these aspects identified as favorable to the adoption of good eating behaviour to obtain a better result. In the same way, it is imperative to sensitize the leaders of the Executive Committee of the Beninese Federation of Handball to facilitate the provision of teams, specialists in nutrition and dietetics of the sportsman, then adequate means to meet the dietary requirements of the elite female handball players. It is also desirable that a training or capacity building programme be developed for the members of the technical coaching staff to raise their level of knowledge on sports nutrition. This acquired ability will allow them to easily advise players in the area of nutrition. In light of these findings, it will be essential to conduct a study to better identify and understand the qualitative data collected during this survey.

## REFERENCES

- Abd El-Shaheed A., Mahfouz N., Moustafa R. and Elabd M. (2019). Alarming eating behaviours among adolescents in Egypt. *Open Access Maced. J. Med. Sci.*, **7** (13), 2189-2193. DOI: [10.3889/oamjms.2019.583](https://doi.org/10.3889/oamjms.2019.583)
- AFSSA (2000). Apports nutritionnels conseillés pour les sportifs. Synthèse des recommandations de l'AFSSA, CNERNA-NRS. Agence Française de Sécurité Sanitaire des Aliments (AFSSA). Maisons-Alford. URL: [https://blog.nutridays.fr/wp-content/uploads/doc-recommandations\\_alimentaires-sro-sportif.pdf](https://blog.nutridays.fr/wp-content/uploads/doc-recommandations_alimentaires-sro-sportif.pdf)
- Casa D.J., Chevront S.N., Galloway S.D. and Shireffs S.M. (2019). Fluids needs for training, competition, and recovery in track-and-field athletes. *Int. J. Sport Nutr. Exerc. Metab.*, **29** (2), 175-180. DOI: [10.1123/ijsnem.2018-0374](https://doi.org/10.1123/ijsnem.2018-0374)
- Cornil Y., Gomez P. and Vasiljevic D. (2020). Food as fuel: Performance goals increase consumption of high-calorie foods at the expense of good nutrition. *J. Consum. Res.*, **47** (2), 147-166. DOI: [10.1093/jcr/ucaa012](https://doi.org/10.1093/jcr/ucaa012)
- Costa H.S., Vasilopoulou E., Trichopoulou A. and Finglas P. (2010). New nutritional data on traditional foods for European food composition databases. *Europ. J. Clin. Nutr.*, **64** (3), S73-S81. DOI: [10.1038/ejcn.2010.215default/files/2019-05/0\\_Regulations%20F](https://doi.org/10.1038/ejcn.2010.215default/files/2019-05/0_Regulations%20F)
- Ejemot-Nwadiaro R.I., Ehiri J.E., Arikpo D., Meremikwu M.M. and Critchley J.A. (2015). Hand washing promotion for preventing diarrhoea. *Cochrane Database Syst. Rev.*, **1** (9), 1-81. DOI: [10.1002/14651858.CD004265.pub3](https://doi.org/10.1002/14651858.CD004265.pub3)
- Etiévant P., Bellisle F., Dallongeville J., Etilé F., Guichard E. *et al.* (2010). Les comportements alimentaires. Quels en sont les déterminants? Quelles actions, pour quels effets? <https://hal.archives-ouvertes.fr/hal-02182262>
- Gacek M. (2015). Association between self-efficacy and dietary behaviours of American football players in the Polish Clubs in the light of dietary recommendations for athletes. *Rocz. Panstw. Zakl. Hig.*, **6** (4), 361-366. DOI: [10.1002/ajhb.22403](https://doi.org/10.1002/ajhb.22403)
- Gouda S. and Kpazaï G. (2012). Le développement du sport de performance au Bénin: De l'analyse d'un modèle à un essai de problématique globale. *Conseil pour le développement de la recherche en Sciences Sociales en Afrique, Afrique et développement.*, **37**, 97-118
- Gouthon P., Nouatin B.K., Messan F., Adido C., Tonon B.A. *et al.* (2015). Repeated-sprint ability and its correlates among handball players in Porto-Novo, Republic of Benin. *Gazz. Med. Ital.*, **174** (11), 491-498. URL: <https://www.minervamedia.it/en/journals/gazzetta-medica-italiana/article.php?Cod=R22Y2015N11A0491>
- Herman P. (2017). The social facilitation of eating or the facilitation of social eating? *J. Eat. Disord.*, **5**, 16. DOI: [10.1186/s40337-017-0146-2](https://doi.org/10.1186/s40337-017-0146-2)
- IHF (2018). Règlement pour les compétitions de la l'IHF, chap V. Fédération Internationale de Handball. URL: <https://www.ihf.info/sites/>
- Joy E., Kussman A. and Nattiv A. (2016). Update on eating disorders in athletes: A comprehensive narrative review with a focus on clinical assessment and management. *Brit. J. Sports Med.*, **50** (3), 154-162. DOI: [10.1136/bjsports-2015-095735](https://doi.org/10.1136/bjsports-2015-095735)
- Kelly M.P. and Barker M. (2016). Why is changing health-related behaviour so difficult? *Public Health.*, **136**, 109-116. DOI: [10.1016/j.puhe.2016.03.030](https://doi.org/10.1016/j.puhe.2016.03.030)
- Kenefick R.W. (2018). Drinking strategies: Planned drinking versus drinking to thirst. *Sport Med.*, **48** (1), S31-S37. DOI: [10.1007/s40279-017-0844-6](https://doi.org/10.1007/s40279-017-0844-6)
- La Bounty P.M., Campbell B.I., Jacob W., Elfego G., John B. *et al.* (2011). International society of sports nutrition position stand: Meal frequency. *J. Int. Soc. Sport Nutr.*, **8** (4), 1-4. DOI: [10.1186/1550-2783-8-4](https://doi.org/10.1186/1550-2783-8-4)
- Linta L.S.O., Gouthon P., Hountohotègbé T., Messan F., Nouatin B.K. *et al.* (2020). Réponses inflammatoires au cours d'une série de matchs chez des handballeurs de l'élite en République du Bénin. *Int. J. Biol. Chem. Sci.*, **14** (4), 1354-1366. DOI: [10.4314/ijbcs.v14i4.15](https://doi.org/10.4314/ijbcs.v14i4.15)
- Martinez-Rodriguez A., Martinez-Olcina M., Hernandez-Garcia M., Rubio-Aria J.A., Sánchez-Sánchez J. *et al.* (2020). Body composition characteristics of handball players: Systematic review. *Arch. Med. Deporte.*, **37** (1), 52-61. URL: <https://www.researchgate.net/publication/342551526>
- Menzel J.E., Reilly E.E., Lu T.J. and Kaye M.D. (2019). Conceptualizing the role of disgust in avoidant/restrictive food intake disorder: Implications for the etiology and treatment of selective eating. *Int. J. Eat. Disord.*, **52** (4), 462-465. DOI: [10.1002/eat.23006](https://doi.org/10.1002/eat.23006)

- Nago E.S., Verstraeten R., Lachat C.K., Dossa R.A. and Kolsteren P.W. (2012). Food safety is a key determinant of fruit and vegetable consumption in urban Beninese adolescents. *J. Nutr. Edu. Behav.*, **44** (6), 548-555. DOI: [10.1016/j.jneb.2011.06.006](https://doi.org/10.1016/j.jneb.2011.06.006)
- Nhantumbo L., Riberio J.A., do Santos F.K., Jani I.V., Gudo E.S. *et al.* (2013). Nutritional status and its association with physical fitness, physical activity and parasitological indicators in youths from rural Mozambique. *Amer. J. Hum. Biol.*, **25** (4), 516-523. DOI: [10.1002/ajhb.22403](https://doi.org/10.1002/ajhb.22403)
- Nicklaus S. and Bourne M. (2016). Facteurs externes influençant le comportement alimentaire humain. *Ann. Endocrinol.*, **77** (4), 241-247. <https://doi.org/10.1016/j.ando.07.021>
- Nouatin B.K., Gouthon P., Amousou-Guénou D., Dansou P.H., Messan F. *et al.* (2015). Changes and recovery in fitness capacities following a series of handball matches played in the sub-tropical climate by division 1 amateur players. *Biol. Exerc.*, **12** (2), 1-14. DOI: [10.4127/jbe.2015.0089](https://doi.org/10.4127/jbe.2015.0089)
- Nwachukwu C.U. and Achike A.I. (2020). Determinants of consumption preference of local versus imported rice brands in Enugu State, Nigeria. *Agro-Science*, **19** (1), 31-36. DOI: <https://dx.doi.org/10.4314/as.v19i1.5>
- Okugn A. and Woldeyohannes D. (2018). Food hygiene practices and its associated factors among model and non-model households in Abobo District, Southwestern Ethiopia: Comparative cross-sectional study. *Plos One.*, **13** (4) e0194391. DOI: [10.1371/journal.pone.0194391](https://doi.org/10.1371/journal.pone.0194391)
- Olarewaju T.O., Orumwense L.A., Oke O.S., Idowu A.B. and Adeboye T.E. (2020). Assessment of knowledge on functional values of edible insects in peri urban communities of Ijebu Ode Local Government Area, Ogun State Nigeria. *Agro-Science*, **19** (4), 1-5. DOI: <https://dx.doi.org/10.4314/as.v19i4.1>
- Ono M., Kenedy E., Reeves S. and Cronin L. (2012). Nutrition and culture in professional football: A mixed method-approach. *Appetite.*, **58** (1), 98-104. DOI: [10.1116/j.appet.2011.10.007](https://doi.org/10.1116/j.appet.2011.10.007)
- Palomares E. (2000). Les cadres sociaux de l'identification culturelle: Une approche par l'alimentation à Cotonou. *Bastidiana*, **31-32**, 208-223. <https://halshs.archives-ouvertes.fr/halshs-01299171/document>
- Prochaska J. and Di Clemente C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *J. Consult. Clin. Psychol.*, **51** (3), 390-395. <https://doi.org/10.1037/0022-006X.51.3.390>
- Saavedra J.M. (2018). Handball research: State of the art. *J. Hum. Kinet.*, **63** (1), 5-8. DOI: [10.2478/hukin-2018-0001](https://doi.org/10.2478/hukin-2018-0001)
- Sas-Nowosielskir Z. and Wycislik J. (2019). Apport énergétique et en macronutriments des grimpeurs sportifs polonais avancés. *J. Phys. Educ. Sport*, **19** (Suppl. 3), 829-832. DOI: [10.7752/jpes.2019.s3119](https://doi.org/10.7752/jpes.2019.s3119)
- Tonon B., Agboton B., Falola J., Gouthon P., Nigan I., Ouendo E., Agboton H. and Poortmans J. (2012). Renal responses to a series of handball games played in Sub-saharan environment by amateur division 1 of female players. *Adv. Phys. Edu.*, **2**, 103-109. DOI: [10.4236/ape.2012.23019](https://doi.org/10.4236/ape.2012.23019)
- WHO (2018). *Global strategy on diet, physical activity and health: Thirteenth general programme of work, 2019–2023*. World Health Organization, Geneva. URL: <https://www.who.int/fr/news-room/fact-sheets/detail/healthy-diet>
- WHO/FAO (2003). *Diet, nutrition and the prevention of chronic diseases*. World Health Organization/Food and Agriculture Organization of the United Nations, Geneva. URL: [https:// apps.who.int/iris/bitstream/handle/10665/42665/WHO\\_TRS916.pdf.jsessionid=7213A07663929BFB62344C2FDF5B80?sequence=1](https://apps.who.int/iris/bitstream/handle/10665/42665/WHO_TRS916.pdf.jsessionid=7213A07663929BFB62344C2FDF5B80?sequence=1)