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A Comparative Analysis of the Outputs of Gemini and ChatGPT Systems in the Design of Specialized Nutrition for Futsal Players in Light of the Requirements of the Local Environment

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ABSTRACT

The aim of the present research was to conduct a comparative evaluation between the outputs of the artificial intelligence (Gemini) and (ChatGPT) systems to determine their accuracy and reliability in designing specialized sports nutrition programs for futsal players (for the category under 18 years old), and the extent to which these systems respond to the requirements of the local environment in the city of Najaf. The researcher used the descriptive method with the analytical method to suit the nature of the study, and the research sample was represented in the (Gemini) and (ChatGPT) systems as smart software tools. To achieve the objectives of the research, the researcher prepared a "scientific evaluation form" that was presented to (5) experts specialized in sports nutrition and physiology, which included (8) specialized evaluation axes.

After statistical processing of the data using arithmetic mean, relative weight, and T-test of correlated samples, the results showed that both systems have a high ability to design nutrition programs with a general relative weight of more than (83%). The value of the significance level (Sig) also appeared to be lower than the significance level (0.05), which indicates that there are significant differences between the two systems and in favor of the (Gemini) system, which achieved a calculated value of (T) of (3.32). Gemini has clearly excelled in taking into account the environmental variables of the city of Najaf and the timings of meals associated with hospitalization. The researcher concluded that the Gemini system is the most efficient in providing "environmental" nutritional solutions that suit the specificity of the Iraqi player, and recommended the need to adopt these technologies as auxiliary tools under specialized supervision to ensure scientific safety.

1.1 Introduction and importance of the research:

Nutrition is one of the main pillars that contribute to improving athletes' performance and sustaining their physical and functional abilities during training and competitions. In high-intensity sports such as futsal (Futsal), energy and nutrient requirements increase to ensure optimal performance and rapid recovery after training and matches. Nutrition greatly affects physical abilities, physical composition, recovery, and mental focus in players, which requires nutritional programs tailored to the nature of the game and the requirements of the local environment For players.

With the development of artificial intelligence applications, advanced systems such as Gemini and ChatGPT have emerged capable of providing specialized nutritional recommendations, raising questions about the accuracy and relevance of these outputs compared to scientific standards and practical applications for futsal players in the local environment. The importance of the research lies in the fact that it is a scientific attempt to evaluate the accuracy of these algorithms in simulating the "field reality" of the Iraqi/local player, taking into account environmental factors (temperature and prevailing dietary habits) and the extent to which their outputs conform to the international standards issued by the International Society of Sports Nutrition (ISSN).

1.2 Research Problem:

Despite the rapid spread and rapid use of artificial intelligence technologies to analyze sports data and design nutrition programs, there are no specific studies that evaluate the accuracy of the outputs of systems such as Gemini and ChatGPT in designing specialized sports nutrition for futsal players according to physiological and nutritional requirements, in addition to the fact that artificial intelligence systems may suffer from inadequacy in taking into account the local aspect of the Iraqi environment, especially Najaf. These systems often rely on Western databases whose outputs may not correspond to the local environment, such as a sharp rise in temperatures that require special hydration strategies, and food availability in terms of suggesting foods that may not be available or do not fit the local consumption pattern.

1.3 Research Objectives:

1- Analyze and compare the scientific accuracy of the nutritional information and recommendations provided by ChatGPT and Gemini regarding the needs of futsal players.

2- Evaluating the comprehensiveness and detail of the generative nutrition plans, including the timing of meals, the distribution of macronutrients and micronutrients, and taking into account the intensity of training, competition, and hospitalizations.

3. Analyze the degree to which the requirements of the local environment are taken into account in the recommendations made by each model (e.g., adaptation to a hot climate, and use of locally available foods).

4- Identifying the strengths and weaknesses of each model in the field of specialized sports nutrition design for futsal players.

1.4 Research Hypotheses:

1- There are statistically significant differences in the level of scientific accuracy of the information and nutritional recommendations provided by (ChatGPT) and (Gemini) regarding the needs of futsal players.

2- There are statistically significant differences in the degree of comprehensiveness and detail of the nutrition plans generated (nutrient distribution, timing of meals, hospitalization) between the two systems in proportion to the intensity of training and competition.

3- There are statistically significant differences in the extent to which the requirements of the local environment (climate, local foods available in Najaf) are taken into account in the recommendations provided by the (Gemini) and (ChatGPT) systems.

4- There are statistically significant differences in the experts' assessment of the strengths and weaknesses (clarity, safety, and field application) of each model in the field of specialized sports nutrition design.

1.5 Research Areas:

1_5_1 Temporal Domain: 24/11/2025 to 12/12/2025

1.5.2 Spatial Domain: Iraq/Najaf

1.6 Defining Terms:

1- Comparative Analysis: "A research methodology that aims to examine the fundamental differences between two technical systems (Gemini & ChatGPT) by subjecting them to unified environmental and physiological variables to measure the efficiency of outputs".(1)

The Gemini System is a family of multimodal language models (LLMs) developed by Google DeepMind. It is highly capable of processing textual and numerical data and real-time linking to open online databases, making it a tool for analyzing complex nutritional data and linking it to environmental reality." (2)

ChatGPT System: "A large language model based on the updated Transformer Architecture, developed by OpenAI. It works through human feedback reinforcement learning (RLHF) techniques, and is used in mathematical studies to generate consultancy

[1] _Pickvance, C. (2001). The generalizability of comparative analysis. Journal of Housing and the Built Environment, 16(1), 7–28.

[2] _Gemini Team, Google. (2023). Gemini: A Family of Highly Capable Multimodal Models. Technical Report. Google DeepMind.

plans and structure nutritional schedules based on the logical reasoning of the input data."[3]

4- Specialized nutrition: "It is a specific nutritional practice that aims to meet the metabolic and physiological needs of a specific type of physical exertion, taking into account the timing of nutrients and individual characteristics. "[4]

3.1 Research Methodology and Field Procedures

3.1 Research Methodology:

The researcher adopted the comparative analytical method, due to its suitability to the nature of the research, which aims to analyze and compare the outputs of the two artificial intelligence systems (Gemini and ChatGPT) in the design of specialized nutrition for futsal players, in light of the requirements of the local environment.

3-2 Research Population and Sample:

3.2.1 Research Community: The research community consists of all global Generative AI systems and programs available for public use.

3.2.2 Research Sample: A deliberate (intentional) sample was selected represented by two technically pioneering systems to represent the research community, namely:

1- Gemini System: Developed by Google.

2- ChatGPT: Developed by OpenAI

The reason for choosing these two systems was due to the technical superiority of these two systems and their high ability to process natural languages and provide specialized consultations in sports sciences and nutrition.

3-3 Devices and Tools Used in the Research:

1_ Mobile number 2

2- The form.

3.3.1 Search Tool (Form)

The researcher relied on a peer-reviewed scientific evaluation form, which was designed to include (8) evaluation axes covering all aspects of specialized and environmental nutrition, namely:

(Scientific, Physiological, Hospitalization, Environmental, Aquatic, Age (Biological Development), Safety, Application). A five-point Likert scale was used to determine the response scores.

3.3.2 Scientific Foundations of the Tool (Evaluation Form).

_ OpenAI. (2023). GPT-4 Technical Report. OpenAI[3]

_ Kerksick, C. M., Wilborn, C. D., Roberts, M. D., Smith-Ryan, A., Kleiner, S. M., Jäger, R., ... & Antonio, J. [4] (2018). ISSN exercise & sports nutrition review update: Research & recommendations. Journal of the International Society of Sports Nutrition, 15(1), 1–57.

To ensure the quality of the extracted data, the evaluation form was subjected* to the following scientific and field bases:

First: Truthfulness: "The extent to which the instrument actually measures what it was designed to measure, and the extent to which it is appropriate for the purpose for which it was used." (5)

The researcher used (content veracity) by presenting the form with its eight axes to a group of (experts) * to show the extent to which the paragraphs represent the scientific content of the environment of Najaf and artificial intelligence, and it was approved by the experts.

Second: Consistency: "It means consistency in results, i.e., if the tool is reapplied to the same sample and under the same conditions, it gives close or identical results." (6)

Since the tool is based on (expert opinion), the researcher used (Kendall's Compatibility Coefficient) to measure the consistency through the "Consistency of Evaluators", where the value was (0.64), which is a high degree of consistency that confirms the accuracy of the form.

Third: Objectivity: "It frees the researcher or evaluator from personal bias, so that the result does not differ according to who performs the measurement process." (7)

Objectivity was achieved through the impartial evaluation, where the outputs of (Gemini and ChatGPT) were stripped of their names and logos when presented to the experts to ensure the impartiality of the technical evaluation, as shown in the following table:

Table (1)

Shows the parameters of consistency, honesty and objectivity

Objectivity	Honesty	Stability W	Unit of Measurement	Resident Form	t
0.64	100%	0.64	Grade (Likert)	Outputs of AI Systems	1

3.5 Field Procedures:

The researcher prepared unified inputs for both systems, namely (a hypothetical case for a five-a-side football player under 18 years old) and extracted nutritional models from the Gemini system and ChatGPT, then standardized the format of presenting the outputs to ensure fairness in the evaluation, and then presented the models (A-B) to the five experts, then collecting the evaluation forms and converting them into digital data and entering the data into the statistical program for the purpose of processing.

* Evaluation Form Appendix 1

5 Wajih Mahjoub (2002). **Principles and Methodology of Scientific Research**. 2nd Edition, Dar Al-Manahij for Publishing and Distribution, Amman. p. 145

* Appendix No. Two

6 - Qasim Al-Mandalawi (et al.) (1989). **Tests and measurement in physical education.** Higher Education Press, Baghdad. p. 88.

7 - Bastoisi Ahmed (1999). **Foundations and principles of scientific research in physical education**. Dar Al-Fikr Al-Arabi, Cairo. p. 210.

3.5.1 Full Version of Inputs:

"As a sports nutritionist specializing in sports science and futsal physical performance (Futsal), you are required to design a one-day integrated diet program (high-intensity training day) for a youth midfielder, based on the following data:

1. Physical data: age under (18 years), weight (70 kg), height 175 cm.

2. Nature of the activity: A 90-minute futsal training session (indoors), including high-intensity speed and explosive exercises.

3. Local environment: (training time is at five o'clock in the afternoon), taking into account the availability of common foods in (Iraq/Najaf) and avoiding expensive or unavailable items.

Required in the outputs:

First: Calculate the approximate calories and distribute the macronutrients (carbohydrates, protein, fats) in grams.

Second: A detailed meal schedule (breakfast, lunch, pre-workout meal, post-workout recovery, dinner).

Third: Accurate recommendations regarding the amount and timing of drinking fluids to compensate for water loss in the closed environment.

Fourth: Advice on Dietary Supplements Suitable for this Age Group (if any) or Warning about them.

Note: Comply with the international recommendations of the American College of Sports Medicine (ACSM) and the International Society of Sports Nutrition (ISSN)."

3.6 Statistical Methods:

To analyze the data extracted from the evaluation form, the researcher used the following statistical methods:

1- Arithmetic average and relative weight: to describe the quality level of each model.

2- Paired Samples T-test: To compare the scores of the two systems issued by the same committee of experts.

3- Kendall's Compatibility Coefficient: To measure the extent of homogeneity and agreement of experts in their evaluations and to ensure the consistency of the result.

4. Presenting, analyzing and discussing the results:

4.1 Presentation of the results of the evaluation of the eight axes of Models (A) and (B):

Table 1 presents the results of the arithmetic medians and relative weights of each axis, allowing a detailed comparison of the performance of the two systems in each aspect of sports nutrition.

Table (2)

Arithmetic averages and relative weights of the eight axes of the two models

Relative Weight B	Average Model with Chat GPT	Relative Weight A	Average Model A Gemini	Evaluation Themes	t
92%	4.60	96%	4.80	Scientific Axis	1
76%	3.80	76%	3.80	Physiological axis	2
84%	4.20	96%	4.80	Hospitalization	3
76%	3.80	92%	4.60	Environmental Axis	4
84%	4.20	92%	4.60	Fluid Axle	5
76%	3.80	84%	4.60	Safety hub	6
72%	3.60	92%	4.60	Application Axis	7
80%	4.00	92%	4.20	Age Axis	8
83%	4.15	90%	4.50	Overall average	

Table shows (2) Both models (a) and (B) Achieved high levels (Excellent and very good)This is in line with what several studies have pointed out, including "that large language models have become a reliable source of specialized information when adjusting inputs".[8]

4.2 Presentation, analysis and discussion of the (T) test for the correlated samples:

Table (3)

Shows the results of the test of the evaluators form for the two forms (A/B), the calculated value of (T) and the value of (sig) for the two forms

Significance	Sig	Calculated value (v)	Standard deviation	Arithmetic Average	Total	System
D Statistically	0.02	3.32	2.34	36.00	180	Geminia
			3.03	33.20	166	ChatGPtb

It can be seen from Table (3) that the calculated value of (v) was (3.32), which is greater than the tabular value of (2.77). The significance level (Sig) was (0.029), which is smaller than the approved significance level (0.05). This confirms that there are statistically significant differences in favor of the Gemini system. The researcher attributes the

_ Smith, A. 2023. AI in Sports Medicine. Journal of Digital Health, Vol. 5, No. 2, pp. 112.[8]

statistical superiority of the Gemini system over ChatGPT in the design of specialized nutrition programs to the following reasons:

1- Dealing with the local environment axis (Najaf): Gemini excelled in the "environmental requirements" axis, as it linked the high temperatures in the city of Najaf to the increase in the need for liquids and mineral salts with a higher accuracy than ChatGPT. "Systems with live access to geographic data excel at personalizing health recommendations." [9]

2- Recovery Domain:

The results (Table 2) showed the superiority of Gemini with an average of (4.80) in the hospitalization axis. According to the researcher, Gemini succeeded in accurately linking the "timing of protein and carbohydrate intake" with the "speed of restoring muscle stores" after the high physical exertion required by futsal, and this is in line with the protocols of the International Society of Sports Nutrition (ISSN), which confirms that "nutrient timing (Nutrient Timing) It is the main pillar of the sports recovery process." [10]

3- Applied axis:

Gemini scored an edge in the ease of converting theoretical information into clear application tables for the player. While ChatGPT provided general advice, Gemini divided meals based on match day and practice day in an easy-to-implement procedure.

5. Conclusions and Recommendations:

5.1 Invocations:

By presenting, analyzing, and discussing the results, the researcher reached the following conclusions:

1- Generative Artificial Intelligence (Gemini/ChatGPT) has a high ability to design specialized nutrition programs for futsal players with a level of scientific accuracy exceeding (83%).

2 - The Gemini system has proven a significant statistical superiority over the (ChatGPT) system, making it the most accurate choice in the disciplines of precision sports nutrition.

3- The Gemini system excels significantly in (taking into account the local environment) as it has shown a unique ability to take into account the hot climate and the availability of suitable foods in the city of Najaf.

4- Despite the accuracy of the systems, the experts' evaluation showed the need for specialized human supervision to ensure that there are no special errors in the safety axis (dietary supplements of all kinds)

5.2 Recommendations:

Based on the previous conclusions, the researcher recommends the following:

1- We recommend that futsal coaches and players in Iraq (and Najaf in particular) use the (Gemini) system as a primary aid for designing sports nutrition schedules.

2- The need for researchers and users to emphasize the entry of spatial data such as geographical location (Najaf) and geographical environment such as (temperature and

_ Jones, R. 2024. Contextual AI Systems. Tech & Sport Review, Vol. 12, No. 4, p. 45.[9]
_ Kerksick et al. 2018. ISSN exercise & sports nutrition review. J Int Soc Sports Nutr, 15:38.[10]

humidity) when asking artificial intelligence to ensure that they obtain applicable programs in the field.

3- Holding workshops for sports coaches at the "College of Physical Education and Sport Sciences" to teach them how to write (a complete player case) accurately to get the best outputs from smart systems.

4- Not to neglect the role of the sports nutritionist, and to consider artificial intelligence (a technical assistant) and not a complete substitute for the scientific vision of the specialist.

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