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Personalized Hydration Strategies Based on Training Time and Environmental Factors Among Football Players in Inner Mongolia, China

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Abstract: This study examines the personalized hydration strategies of football athletes in Inner Mongolia, China, focusing on their perceived effectiveness in improving athletic performance, recovery, and health. Data were collected from 200 football athletes, assessing their views on the impact of hydration strategies on performance metrics, hydration logs, symptom monitoring, recovery quality, and body metrics. The results indicate that athletes find personalized hydration strategies effective, with hydration logs being the most highly rated aspect for ensuring consistent fluid intake. Endurance and strength during training sessions were particularly positively impacted by hydration, while symptom monitoring and tracking body metrics were seen as less effective. Despite some variation in the perceived effectiveness of different strategies, no significant differences were found across demographic factors, including age, gender, or years of experience. The study concludes that while personalized hydration strategies are widely considered beneficial, greater emphasis on symptom monitoring and body metrics could further enhance hydration practices. The findings suggest a need for educational interventions to improve hydration awareness and application among athletes.

Keywords: Personalized hydration, football athletes, performance metrics, recovery quality, hydration logs, symptom monitoring

Introduction

Proper hydration is essential for optimizing football players' performance, yet individual hydration needs vary depending on factors such as training time and environmental conditions. Personalized hydration strategies help prevent dehydration, enhance endurance, and support overall physiological function [1]. This study explores the impact of training schedules and environmental factors on hydration requirements among football players in Inner Mongolia, China, with the goal of developing tailored hydration strategies to optimize performance and recovery.

Training time plays a significant role in determining hydration needs. Morning sessions, typically conducted in cooler temperatures, reduce sweat loss but still ^require adequate fluid replenishment. In contrast, afternoon workouts in hotter conditions lead to increased sweat rates, necessitating a more structured hydration approach [2], [3]. Adapting fluid intake based on training schedules can enhance endurance and minimize dehydration risks. Environmental conditions, particularly temperature and humidity, further influence hydration requirements. Hot and humid climates accelerate fluid loss, increasing the risk of dehydration and making structured hydration plans essential [4]. While cooler conditions may reduce sweat rates, proper hydration remains critical for maintaining physiological function and muscle performance [5]. Additionally, individual differences in sweat composition and electrolyte loss impact hydration strategies. Some athletes lose higher amounts of sodium through sweat and may require electrolyte-rich beverages to maintain fluid-electrolyte balance [6]. Customizing hydration plans based on sweat analysis helps maintain homeostasis and optimize performance [7].

Specifically, the study will answer the following questions:

What is the demographic profile of the football athlete respondents in terms of sex, age, and number of years as a football athlete in the university?

How do football athlete respondents evaluate their personalized hydration strategies in terms of performance metrics, hydration logs, symptom monitoring, recovery quality, and body metrics?

Is there a significant difference in the evaluation of the football athlete respondents of their personalized hydration strategies when they are grouped according to their profile?

The type and intensity of exercise also shape hydration requirements. Endurance athletes require greater fluid intake due to prolonged exertion, whereas strength-based training demands sufficient hydration for muscle function and recovery [8]. Aligning hydration strategies with training intensity helps mitigate dehydration risks and optimize athletic performance. Hydration before, during, and after training is crucial for maintaining fluid balance. Pre-training hydration ensures athletes begin workouts in an optimal state, reducing the risk of early dehydration [9]. During training, fluid intake should be balanced with individual tolerance and environmental demands. Small, frequent sips help maintain hydration without causing discomfort, with hotter climates necessitating more frequent intake [3]. Post-training hydration supports recovery by replenishing lost fluids and electrolytes, and individualized rehydration plans—using post-exercise weighing and urine

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analysis—help athletes recover efficiently [4].
Regular monitoring of hydration status through urine color, body weight tracking, and advanced hydration assessment techniques allows for ongoing adjustments to hydration strategies [5]. Additionally, education plays a vital role in promoting effective hydration practices. Providing athletes and coaches with knowledge on hydration strategies through workshops and training sessions enhances awareness and encourages adherence to personalized hydration plans [1].
This study will examine the relationship between training time, environmental factors, and individualized hydration needs to contribute to the development of evidence-based hydration strategies for football players in Inner Mongolia. The findings will offer practical insights for athletes, coaches, and sports scientists seeking to optimize performance and recovery through tailored hydration approaches.

Literature Review

Maintaining adequate fluid intake is critical for optimizing athletic performance, particularly in physically demanding sports like football, where physiological demands and thermoregulatory challenges are pronounced. Emerging research underscores the necessity of customized fluid replacement plans tailored to individual athletes, accounting for variables such as training schedules, environmental conditions, and physiological differences [10]. These adaptive approaches are vital in mitigating dehydration risks and enhancing endurance, especially in regions with extreme climates where heat and humidity amplify fluid loss [11]. For instance, training sessions scheduled during cooler periods, such as early mornings or evenings, present distinct hydration challenges compared to midday practices, necessitating dynamic strategies [12]. Furthermore, altitude training exacerbates fluid depletion due to elevated respiratory rates, while high humidity impedes sweat evaporation, compounding dehydration risks [13], [14]. Collectively, these findings highlight the imperative for context-specific hydration protocols to sustain performance and health.
The consequences of fluid imbalance extend beyond physical decline, impairing cognitive function and cardiovascular efficiency [15]. Paradoxically, excessive fluid consumption poses health hazards, emphasizing the need for precision in hydration practices [16]. Current guidelines advocate multifaceted monitoring—combining body mass measurements, urine analysis, and thirst perception—to inform individualized plans [17]. Despite this, studies reveal a disconnect between athletes' self-assessment and physiological reality: many underestimate sweat losses by over 70% and misjudge fluid intake, leading to inadvertent dehydration [18], [19]. Educational interventions have shown promise in improving hydration literacy among youth athletes, suggesting similar potential for adult populations [20]. However, adherence remains inconsistent, with fewer than 15% of athletes employing body mass metrics despite their efficacy [21]. This gap underscores the need for integrating hydration education into routine training regimens.
Athletic development, meanwhile, is shaped by a complex interplay of training volume, recovery, and environmental support. While the debated "10,000-hour rule" posits extensive deliberate practice as a pathway to expertise, sport-specific variances exist—elite gymnasts and triathletes often exceed this threshold, whereas team-sport athletes like hockey players achieve proficiency with fewer hours [22]. Youth training, particularly, demands caution to prevent overuse injuries, with recommendations advising against exceeding age-adjusted weekly hours [23]. Finnish studies highlight that young athletes average 12 weekly training hours, often insufficient to meet moderate-to-vigorous physical activity (MVPA) guidelines, emphasizing the role of unstructured play in filling this gap [24], [25]. Gender disparities persist, with males typically engaging in higher-intensity training, while goal orientation—ranging from recreational to elite aspirations—further influences commitment and injury risk [26], [27].
External factors, including social support and environmental resources, significantly modulate motivation and performance. Access to quality facilities, familial encouragement, and peer networks enhance drive and output, whereas negative social media exposure and inadequate equipment detrimentally impact psychological well-being [28], [29]. Theoretical frameworks, such as Bandura's Social Learning Theory and Maslow's Hierarchy of Needs, elucidate how supportive environments foster self-efficacy and fulfillment, propelling athletes toward goals [30]. Coaches, thus, play a pivotal role in cultivating resilience against external pressures while leveraging positive reinforcement to sustain motivation.

Methodology

Research Locale

This study will be conducted in ten selected colleges and universities located in the Inner Mongolia Autonomous Region of China. These institutions were chosen to provide a representative sample of football athletes in the region. The focus will be on gathering data from football players within these schools to assess the impact of personalized hydration strategies on their performance, considering factors such as training time and environmental conditions.

Sampling Technique

The respondents will consist of football athletes from the selected colleges and universities. A purposive sampling technique will be used to select participants who meet specific criteria. These criteria include being a football player at one of the selected institutions, having at least one year of experience in football, and being available during the study period. This approach ensures that the sample is directly relevant to the study's objectives and allows for in-depth analysis of athletes' hydration needs and strategies.

Research Instrument

The researcher will develop a researcher-made questionnaire to collect data on athletes' personalized hydration strategies and how these strategies relate to their training time and environmental factors. The questionnaire will be administered face-to-face to ensure clarity and allow for any questions to be addressed immediately.The questionnaire will utilize

Likert scales to measure the effectiveness of hydration strategies and the satisfaction level of athletes regarding their training time and environmental factors. For personalized hydration strategies, the scale ranges from 1.00 to 4.00, with scores indicating varying levels of effectiveness.

Data Gathering Procedure

The researcher will first seek permission from the principals of the selected colleges and universities in the Inner Mongolia Autonomous Region. Once permission is granted, the researcher will approach the football coaches to request their cooperation in distributing consent forms to the athletes. Only those who voluntarily agree to participate will be included in the study. The researcher will explain the study's purpose and provide instructions on how to complete the questionnaire. After ensuring that the athletes understand the questions, the survey will be administered face-to-face. Participants will be given sufficient time to answer the questions, and once completed, the researcher will collect the questionnaires for data analysis.

Statistical Treatment

Data collected from the questionnaires will be analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics, such as frequency counts, percentages, means, and standard deviations, will be used to analyze the demographic data and responses to the personalized hydration strategies and training/environmental factors. For inferential analysis, one-way ANOVA with post-hoc analysis will be applied to identify significant differences in athletes' hydration strategies and training/environmental factors. Additionally, Pearson's r correlation analysis will be used to examine the relationships between personalized hydration strategies and the athletes' training times and environmental conditions. These statistical methods will allow for a comprehensive understanding of the impact of hydration on athletic performance.

Results

Table 1

Frequency Distribution of the Football Athlete Respondents' Profile

Profile	**Frequency**	**Percentage**
Age		
Less than17 years old	38	19%
17-18years old	41	20.5%
19-20 years old	36	18%
21-22years old	39	19.5%
22 years old and above	46	23%
Total	200	100%
Sex		
Male	85	42.5%
Female	115	57.5%
Total	200	100%
Number of Years as an Athlete		
1-3 years	105	52.5%
4-6 years	41	20.5%
7-9 years	51	25.5%
More than 9 years	3	1.5%
Total	200	100%

Table 1 presents the demographic profile of the football athlete respondents, including age, sex, and years of experience. The largest age group consists of athletes aged 22 years and above (23%), followed closely by those aged 17-18 years old (20.5%) and 21-22 years old (19.5%). The remaining respondents are either younger than 17 (19%) or between 19-20 years old (18%), indicating a well-distributed age range among the participants. In terms of gender, female respondents (57.5%) outnumber male respondents (42.5%), highlighting a higher representation of female football players in the study. Regarding years of experience, most athletes have been playing football for 1-3 years (52.5%), followed by those with 7-9 years (25.5%) and 4-6 years (20.5%) of experience. Only a small fraction (1.5%) has played for more than nine years. This distribution suggests that the majority of respondents are relatively new to the sport, with a smaller proportion possessing extensive playing experience.

Table 2

Assessment of the Football Athlete Respondents on their Personalized Hydration Strategies on Performance Metrics

	Mean	**SD**	**Qualitative Description**	**Interpretation**	**Rank**

My personalized hydration strategy enhances my endurance during training sessions.	2.72	.91	True of Me	Effective	1
I feel stronger and more capable of intense exercise when following my hydration plan.	2.63	.90	True of Me	Effective	2
My hydration strategy improves my speed and agility on the field.	2.56	.93	True of Me	Effective	5
I notice a significant improvement in my overall athletic performance when I am properly hydrated.	2.63	1.06	True of Me	Effective	2
Following my hydration plan allows me to maintain consistent performance levels throughout a competition.	2.56	.95	True of Me	Effective	5
Composite Mean	2.62	.73	True of Me	Effective	

Legend: 3.51-4.00 Very True of Me/ Very Effective; 2.51-3.50 True of Me / Effective; 1.51-2.50 Slightly True of Me / Somehow Effective 1.00-1.50 Not True of Me/ Not Effective

Table 2 assesses the effectiveness of football athletes' personalized hydration strategies based on performance metrics. The highest-rated statement, "My personalized hydration strategy enhances my endurance during training sessions" (Mean = 2.72, SD = 0.91), indicates that athletes generally perceive their hydration plans as beneficial in sustaining endurance. This is followed by statements emphasizing increased strength and improved overall athletic performance, both receiving a mean score of 2.63, further supporting the effectiveness of hydration in maintaining energy levels. Meanwhile, "My hydration strategy improves my speed and agility on the field" and "Following my hydration plan allows me to maintain consistent performance levels throughout a competition" scored slightly lower (Mean = 2.56), though still falling within the "Effective" range. The composite mean of 2.62 suggests that, overall, athletes believe their hydration strategies positively impact their performance, particularly in endurance and strength, though improvements in agility and consistency may require further optimization.

Table 3
Assessment of the Football Athlete Respondents on their Personalized Hydration Strategies on Hydration Logs

	Mean	**SD**	**Qualitative Description**	**Interpretation**	**Rank**
I keep accurate records of my fluid intake throughout the day.	2.65	.98	True of Me	Effective	3
Reviewing my hydration logs helps me identify patterns in my fluid consumption.	2.58	.90	True of Me	Effective	5
I use my hydration logs to adjust my fluid intake based on my training schedule.	2.66	.97	True of Me	Effective	2
Recording my fluid intake helps me stay accountable to my hydration goals.	2.74	.82	True of Me	Effective	1
My hydration logs are an essential tool for maintaining my overall health and performance.	2.60	.91	True of Me	Effective	4
Composite Mean	2.64	.72	True of Me	Effective	

Legend: 3.51-4.00 Very True of Me/ Very Effective; 2.51-3.50 True of Me / Effective; 1.51-2.50 Slightly True of Me / Somehow Effective 1.00-1.50 Not True of Me/ Not Effective

Table 3 evaluates the football athletes' assessment of their personalized hydration strategies concerning hydration logs. The highest-rated statement, "Recording my fluid intake helps me stay accountable to my hydration goals" (Mean = 2.74, SD = 0.82), indicates that athletes find tracking their fluid intake beneficial for maintaining hydration discipline. The second highest, "I use my hydration logs to adjust my fluid intake based on my training schedule" (Mean = 2.66), suggests that athletes rely on their records to make informed hydration decisions. Similarly, "I keep accurate records of my fluid intake throughout the day" (Mean = 2.65) ranks third, reinforcing that log-keeping is a common practice. However, the

lower-ranked statement, "Reviewing my hydration logs helps me identify patterns in my fluid consumption" (Mean = 2.58), suggests that fewer athletes analyze trends in their intake. Despite slight variations in individual items, the composite mean of 2.64 classifies hydration logging as "Effective," indicating that while athletes track their fluid intake, further improvements in reviewing and utilizing these logs could enhance their hydration strategies.

Table 4
Assessment of the Football Athlete Respondents on their Personalized Hydration Strategies on Symptom Monitoring

	Mean	SD	Qualitative Description	Interpretation	Rank
I pay attention to early signs of dehydration (e.g., dry mouth, fatigue).	2.47	.98	Slightly True of Me	Somehow Effective	4
Monitoring my hydration status helps me prevent cramping during workouts.	2.39	.97	Slightly True of Me	Somehow Effective	5
I adjust my fluid intake based on how I feel physically (e.g., headaches, dizziness).	2.66	.94	True of Me	Effective	1
Recognizing symptoms of dehydration prompts me to increase my fluid intake promptly.	2.63	.92	True of Me	Effective	2
Symptom monitoring plays a crucial role in maintaining my optimal performance levels.	2.52	.96	True of Me	Effective	3
Composite Mean	2.53	.77	True of Me	Effective	

Legend: 3.51-4.00 Very True of Me/ Very Effective; 2.51-3.50 True of Me / Effective; 1.51-2.50 Slightly True of Me / Somehow Effective 1.00-1.50 Not True of Me/ Not Effective

Table 4 examines football athletes' assessment of their personalized hydration strategies related to symptom monitoring. The highest-rated statement, "I adjust my fluid intake based on how I feel physically (e.g., headaches, dizziness)" (Mean = 2.66, SD = 0.94), suggests that athletes are responsive to their body's hydration signals. Similarly, "Recognizing symptoms of dehydration prompts me to increase my fluid intake promptly" (Mean = 2.63) reinforces that many athletes take action when dehydration signs arise. However, lower-rated items such as "I pay attention to early signs of dehydration (e.g., dry mouth, fatigue)" (Mean = 2.47) and "Monitoring my hydration status helps me prevent cramping during workouts" (Mean = 2.39) indicate that some athletes may not be consistently proactive in identifying dehydration risks. The composite mean of 2.53 falls within the "Effective" range, though the variation in responses suggests that while athletes acknowledge symptom monitoring's importance, more emphasis on early detection and preventative strategies could improve their hydration practices.

Table 5
Assessment of the Football Athlete Respondents on their Personalized Hydration Strategies on Recovery Quality
Legend: 3.51-4.00 Very True of Me/ Very Effective; 2.51-3.50 True of Me / Effective; 1.51-2.50 Slightly True of Me /

	Mean	SD	Qualitative Description	Interpretation	Rank
Proper hydration accelerates my post-training recovery time.	2.47	1.01	Slightly True of Me	Somehow Effective	5
I feel less sore after intense workouts when I adhere to my hydration plan.	2.54	.89	True of Me	Effective	2
Following my hydration strategy helps me recover faster between training sessions.	2.71	.95	True of Me	Effective	1
Hydrating adequately improves my muscle recovery and reduces fatigue.	2.51	.94	True of Me	Effective	4
I notice a significant improvement in my overall recovery quality when I stay hydrated.	2.52	1.03	True of Me	Effective	3
Composite Mean	2.55	.78	True of Me	Effective	

Somehow Effective 1.00-1.50 Not True of Me/ Not Effective

Table 5 evaluates football athletes' assessment of their personalized hydration strategies in relation to recovery quality. The highest-rated statement, "Following my hydration strategy helps me recover faster between training sessions" (Mean = 2.71, SD = 0.95), suggests that athletes recognize hydration as a key factor in reducing recovery time. Similarly, "I feel less sore after intense workouts when I adhere to my hydration plan" (Mean = 2.54) and "I notice a significant improvement in my overall recovery quality when I stay hydrated" (Mean = 2.52) reinforce the perception that proper hydration contributes to post-exercise recuperation. However, "Proper hydration accelerates my post-training recovery time" (Mean = 2.47) was rated the lowest, indicating that while hydration plays a role, other factors might also influence recovery speed. The composite mean of 2.55 falls within the "Effective" range, highlighting that athletes find hydration beneficial for recovery, though there is room for further optimization in their hydration strategies.

Table 6
Assessment of the Football Athlete Respondents on their Personalized Hydration Strategies on Body Metrics

	Mean	SD	Qualitative Description	Interpretation	Rank
I track changes in my body weight to assess my hydration status.	2.40	.91	Slightly True of Me	Somehow Effective	5
Maintaining a consistent hydration plan helps me manage my body composition goals.	2.66	.91	True of Me	Effective	1
I use body composition measurements to gauge the effectiveness of my hydration strategy.	2.49	.80	Slightly True of Me	Somehow Effective	4
Hydration impacts my muscle definition and overall physique.	2.59	.89	True of Me	Effective	2
I adjust my fluid intake based on changes in my body metrics (e.g., weight fluctuations, muscle mass).	2.53	.95	True of Me	Effective	3
Composite Mean	2.53	.69	True of Me	Effective	

Legend: 3.51-4.00 Very True of Me/ Very Effective; 2.51-3.50 True of Me / Effective; 1.51-2.50 Slightly True of Me / Somehow Effective 1.00-1.50 Not True of Me/ Not Effective

Interpretation of Table 6

Table 6 presents athletes' assessments of their personalized hydration strategies concerning body metrics. The highest-rated item, "Maintaining a consistent hydration plan helps me manage my body composition goals" (Mean = 2.66, SD = 0.91), indicates that athletes recognize hydration's role in body composition maintenance. Statements such as "Hydration impacts my muscle definition and overall physique" (Mean = 2.59) and "I adjust my fluid intake based on changes in my body metrics" (Mean = 2.53) suggest that hydration is considered an influential factor in physical conditioning. However, the lowest-rated statement, "I track changes in my body weight to assess my hydration status" (Mean = 2.40), implies that weight monitoring is not a widely adopted practice among athletes. The composite mean of 2.53 classifies body metric assessment as "Effective," though greater awareness and systematic tracking of hydration-related body changes could further improve hydration management.

Table 7
Summary Assessment of the Football Athlete Respondents on their Personalized Hydration Strategies

	Mean	SD	Qualitative Description	Interpretation	Rank
Performance Metrics	2.62	.73	True of Me	Effective	2
Hydration Logs	2.64	.72	True of Me	Effective	1
Symptom Monitoring	2.53	.77	True of Me	Effective	5
Recovery Quality	2.55	.78	True of Me	Effective	3
Body Metrics	2.53	.69	True of Me	Effective	5
Overall	2.57	.44	True of Me	Effective	

Legend: 3.51-4.00 Very True of Me/ Very Effective; 2.51-3.50 True of Me / Effective; 1.51-2.50 Slightly True of Me / Somehow Effective 1.00-1.50 Not True of Me/ Not Effective

Table 7 provides a summary assessment of the football athletes' personalized hydration strategies across different areas. "Hydration Logs" received the highest mean score (2.64), suggesting that athletes find fluid intake tracking to be the most effective aspect of their hydration strategies. "Performance Metrics" followed closely (2.62), indicating that hydration contributes significantly to endurance, strength, and overall physical performance. "Recovery Quality" (2.55) ranked third,

reflecting the perceived impact of hydration on post-exercise recuperation. Meanwhile, "Symptom Monitoring" and "Body Metrics" (both at 2.53) were ranked the lowest, suggesting that athletes are less proactive in adjusting hydration based on physical symptoms or body measurements. The overall composite mean of 2.57 classifies personalized hydration strategies as "Effective," demonstrating that athletes acknowledge the importance of hydration in their training and performance. However, areas such as symptom monitoring and body metrics tracking could benefit from further emphasis to maximize the effectiveness of hydration strategies.

Table 8
Differences in the Assessment of the Football Athlete Respondents on their Personalized Hydration Strategies According to Profile

	Group	Mean	SD	F-value	Sig	Decision on Ho	Interpretation
Performance Metrics	Less than 17 years old	2.7158	.74490	0.696	0.595	Accepted	Not Significant
	17-18 years old	2.5902	.74693				
	19-20 years old	2.7222	.69821				
	21-22 years old	2.4821	.78635				
	22 years old and above	2.6130	.69845				
Hydration Logs	Less than 17 years old	2.5211	.73454	0.834	0.505	Accepted	Not Significant
	17-18 years old	2.7707	.68784				
	19-20 years old	2.6778	.75332				
	21-22 years old	2.7128	.71347				
	22 years old and above	2.5609	.75498				
Symptom Monitoring	Less than 17 years old	2.4474	.71499	0.523	0.719	Accepted	Not Significant
	17-18 years old	2.5220	.81102				
	19-20 years old	2.5833	.78613				
	21-22 years old	2.6718	.75462				
	22 years old and above	2.4739	.83305				
Recovery Quality	Less than 17 years old	2.5158	.83262	0.196	0.94	Accepted	Not Significant
	17-18 years old	2.6000	.76942				
	19-20 years old	2.6333	.74604				
	21-22 years old	2.5179	.75354				
	22 years old and above	2.5130	.85858				
Body Metrics	Less than 17 years old	2.6316	.68895	1.154	0.332	Accepted	Not Significant
	17-18 years old	2.5366	.77645				
	19-20 years old	2.6889	.67518				
	21-22 years old	2.3949	.63160				
	22 years old and above	2.4609	.68621				
Overall	Less than 17 years old	2.5663	.38976	0.552	0.698	Accepted	Not Significant
	17-18 years old	2.6039	.48065				
	19-20 years old	2.6611	.45792				
	21-22 years old	2.5559	.42913				
	22 years old and above	2.5243	.44664				
Performanc	Male	2.5953	.75591	0.196	0.659	Accepted	Not

e Metrics	Female	2.6417	.71794				Significant
Hydration Logs	Male	2.6329	.72693	0.055	0.815	Accepted	Not Significant
	Female	2.6574	.73210				
Symptom Monitoring	Male	2.5859	.76767	0.58	0.447	Accepted	Not Significant
	Female	2.5009	.79001				
Recovery Quality	Male	2.5200	.78510	0.273	0.602	Accepted	Not Significant
	Female	2.5791	.79533				
Body Metrics	Male	2.5859	.70359	0.73	0.394	Accepted	Not Significant
	Female	2.5009	.68997				
Overall	Male	2.5840	.43823	0.016	0.899	Accepted	Not Significant
	Female	2.5760	.44399				
Performanc e Metrics	1-3 years	2.6457	.73289	0.254	0.858	Accepted	Not Significant
	4-6 years	2.5366	.80055				
	7-9 years	2.6471	.69003				
	More than 9 years	2.5333	.75719				
Hydration Logs	1-3 years	2.6933	.72328	0.369	0.776	Accepted	Not Significant
	4-6 years	2.6195	.73730				
	7-9 years	2.5686	.74121				
	More than 9 years	2.7333	.80829				
Symptom Monitoring	1-3 years	2.4990	.80246	0.783	0.504	Accepted	Not Significant
	4-6 years	2.4683	.70514				
	7-9 years	2.6471	.78749				
	More than 9 years	2.9333	.92376				
Recovery Quality	1-3 years	2.5162	.78583	0.937	0.424	Accepted	Not Significant
	4-6 years	2.6829	.85203				
	7-9 years	2.5608	.73541				
	More than 9 years	2.0000	1.00000				
Body Metrics	1-3 years	2.5619	.69730	0.272	0.845	Accepted	Not Significant
	4-6 years	2.5024	.69874				
	7-9 years	2.4980	.69325				
	More than 9 years	2.8000	.91652				
Overall	1-3 years	2.5832	.44177	0.028	0.994	Accepted	Not Significant
	4-6 years	2.5620	.47799				
	7-9 years	2.5843	.42671				
	More than 9 years	2.6000	.16000				

Table 8 presents the differences in football athletes' assessment of their personalized hydration strategies based on their demographic profile, including age, sex, and years of experience. The results indicate that for all categories—Performance Metrics, Hydration Logs, Symptom Monitoring, Recovery Quality, and Body Metrics—there are no statistically significant differences across the various age groups, as all p-values exceed the 0.05 significance threshold. This suggests that age does not significantly influence how athletes perceive the effectiveness of their hydration strategies.

Similarly, when comparing male and female respondents, the findings reveal no significant differences in their assessment of hydration strategies across all categories. Despite minor variations in mean scores, with females rating Performance Metrics slightly higher (2.64 vs. 2.59) and males rating Symptom Monitoring higher (2.58 vs. 2.50), these differences are not statistically significant. This suggests that both male and female athletes perceive hydration strategies similarly in terms of their impact on performance and recovery.

Lastly, when considering the number of years as an athlete, the data again shows no statistically significant differences in the evaluation of hydration strategies. While athletes with more than nine years of experience reported the highest mean score for Symptom Monitoring (2.93) and Body Metrics (2.80), the variations among groups remain statistically insignificant. The overall findings indicate that regardless of experience level, football players assess their hydration strategies with a comparable level of effectiveness. The acceptance of the null hypothesis across all categories reinforces

the conclusion that demographic factors do not significantly impact the perceived effectiveness of personalized hydration strategies among football athletes in Inner Mongolia.

Discussion and Implications

The results of this study suggest that personalized hydration strategies are generally viewed as effective by football athletes in Inner Mongolia, with hydration logs being the most highly regarded aspect. The athletes reported benefits in performance, particularly in terms of endurance and strength, with a composite mean of 2.62 for performance metrics. This finding aligns with existing literature highlighting the importance of hydration for sustaining energy and physical capacity during prolonged exertion. Despite this, athletes noted that their hydration strategies may not be as effective for optimizing speed and agility, suggesting an opportunity for more targeted hydration approaches to enhance these specific aspects of performance. These insights underscore the need for personalized hydration strategies that go beyond general hydration, tailoring intake to the demands of individual athletes and their specific training goals.

One of the key findings in this study is the importance placed on hydration logs. Athletes reported that keeping track of their fluid intake helped them stay accountable and make adjustments based on their training schedule. This is consistent with previous research that emphasizes the role of monitoring and self-regulation in effective hydration strategies. However, the study also indicates that while athletes frequently track their hydration, fewer analyze their intake patterns, suggesting an area for improvement. Encouraging athletes to not only track but also review and adjust their hydration based on insights from their logs could lead to better long-term hydration practices, further enhancing their athletic performance and overall well-being. Hydration monitoring tools and educational resources that help athletes interpret their logs may provide valuable support in this regard.

Interestingly, the study found no significant differences in the assessment of hydration strategies based on demographic factors such as age, gender, or years of experience. This suggests that the effectiveness of personalized hydration strategies is perceived similarly across diverse groups of football players. However, this also implies that further research could explore why symptom monitoring and body metrics were among the lowest-rated areas, despite their potential benefits for improving hydration strategies. It is possible that these areas are not sufficiently emphasized in current training practices, and more education or practical interventions could help athletes better recognize and act on hydration cues like early dehydration signs or changes in body metrics. Overall, the findings highlight the effectiveness of personalized hydration strategies, but also suggest that focused attention on symptom monitoring and body metrics could significantly enhance these strategies for football players.

Conclusion

This study investigates the personalized hydration strategies of football athletes in Inner Mongolia, China, focusing on their perceived effectiveness in enhancing performance, recovery, and overall well-being. The findings reveal that hydration strategies, particularly hydration logs, are considered highly effective for improving endurance and strength, with athletes reporting positive impacts on training sessions and competition performance. While symptom monitoring and tracking body metrics were rated lower, there is a clear recognition that these strategies are beneficial for optimizing hydration practices. The study also found no significant differences in athletes' assessments based on demographic factors such as age, gender, or years of experience, suggesting that hydration strategies are universally viewed as essential by football players across different groups. These findings emphasize the importance of personalized hydration plans and the need for athletes to be educated on more detailed hydration practices, including symptom monitoring and the tracking of body metrics. Further research and interventions should aim to enhance athletes' understanding and application of these practices to improve hydration management and overall athletic performance.

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