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The Effectiveness Of Fan Educational Media In Increasing Knowledge And Hydration In Athletes At PB Karsa Mandiri Makassar

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ABSTRACT

Insufficient hydration knowledge and suboptimal drinking behavior remain critical issues among adolescent athletes, as dehydration has been consistently associated with impaired thermoregulation, reduced cognitive performance, muscle fatigue, and decreased athletic output. High-intensity training increases sweat loss, yet fluid replacement is often inadequate, particularly among athletes with limited hydration literacy. This study aimed to examine the effectiveness of fan educational media in improving hydration knowledge and hydration status among athletes at PB Karsa Mandiri Makassar.A quantitative pre-experimental design using a one-group pretest–posttest approach was employed. Twenty-five adolescent athletes were selected through purposive sampling. Hydration knowledge was assessed using a structured questionnaire, while hydration status was evaluated through urine color observation as a practical field indicator. Data were analyzed using the Wilcoxon Signed Rank Test with a significance level of $\alpha < 0.05$. The results demonstrated a statistically significant increase in knowledge scores, from 64.91 ± 13.11 (pretest) to 92.67 ± 12.45 (posttest) ($p < 0.01$). Hydration status also improved significantly, from 49.82 ± 13.13 to 73.04 ± 8.55 ($p < 0.01$). These findings indicate that visually engaging and portable fan-based educational media effectively enhances both cognitive understanding and hydration-related behavior. In conclusion, fan educational media represents a practical and evidence-informed strategy to strengthen hydration literacy and promote healthier fluid consumption patterns among adolescent athletes.

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INTRODUCTION

Dehydration is one of the most common health problems in athletes and directly impacts physical performance, cognitive function, and increases the risk of injury. Physiologically, fluid loss of ≥2% of body weight has been shown to decrease aerobic capacity, muscle strength, technical accuracy, and decision-making speed (Cheuvront & Kenefick, 2016; Nuccio et al., 2017). In high-intensity, long-duration sports, metabolic heat production increases, resulting in significantly increased sweating. If not balanced with

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adequate rehydration strategies, this condition can develop into chronic hypohydration, which impacts performance and recovery (Sawka et al., 2015; Armstrong et al., 2021).

This issue is especially relevant in adolescents. A UNICEF report (2023) indicates that millions of children and adolescents live with limited access to clean water, increasing the risk of dehydration. In Indonesia, data from the Indonesian Hydration Regional Study (THIRST) reveals a higher prevalence of fluid deficits in adolescents compared to adults, with Makassar among the cities with the highest incidence. This situation indicates that the adolescent population, including school-aged athletes, is a vulnerable group.

Initial observations of PB Karsa Mandiri Makassar athletes showed that the majority of athletes were categorized as underhydrated based on urine color, with some even showing signs of dehydration. This fact demonstrates that hydration issues are not merely theoretical but actual problems in the field that require systematic intervention based on education and monitoring.

Current literature confirms that optimal hydration plays a crucial role in maintaining thermal homeostasis, neuromuscular function, and cognitive capacity during high-intensity exercise (Adan, 2015; Wittbrodt & Millard-Stafford, 2018). Recent studies have shown that good hydration contributes to stable concentration, reaction speed, and tactical decision-making in adolescent athletes (Judelson et al., 2019; Deshayes et al., 2020). Furthermore, adequate hydration has been shown to accelerate the recovery process by optimizing tissue perfusion and energy metabolism (Casa et al., 2019).

In the context of interventions, behavior-based educational approaches have been shown to be effective in increasing hydration awareness and adherence in young athletes (Baker et al., 2016; Chapelle et al., 2022). Visual education models and interactive media, particularly those that are simple, contextual, and engaging, have demonstrated greater effectiveness in adolescent populations compared to conventional lecture approaches (Mayer, 2020; Hidayat et al., 2022). The principles of dual coding theory and multimedia learning suggest that visual-textual combinations enhance information retention and behavior change (Moreno & Mayer, 2016).

Simple visual-based educational media, such as booklets, infographics, and flip media, have been shown to improve health literacy in adolescents in the context of nutrition and hydration (Kusuma et al., 2021; Rahmawati et al., 2023). However, the use of innovative media in the form of "educational fan media" in the context of athlete hydration education remains very limited in the scientific literature.

Although various studies have examined the relationship between hydration and physical and cognitive performance, most studies have focused on physiological aspects and biomarker measurements such as plasma osmolality or urine specific gravity (Kenefick & Sawka, 2018). Research on hydration education interventions for adolescent athletes remains relatively limited, particularly those using contextual visual media based on local characteristics.

In Indonesia, hydration research is mostly prevalence surveys or descriptive studies without structured and measurable educational interventions. Few studies integrate innovative media-based education with direct evaluation of changes in

knowledge and hydration status in club athletes. Furthermore, there are no empirical studies evaluating the effectiveness of fan-shaped educational media as a hydration promotion tool for adolescent athletes.

Therefore, there are research gaps in the following aspects: (1) innovative visual media-based hydration education interventions, (2) implementation in club-level adolescent athletes, and (3) simultaneous evaluation of changes in knowledge and simple field-based hydration indicators.

Based on these issues and gaps, this study aims to analyze the effectiveness of hydration education using educational fan media on improving the knowledge and hydration status of adolescent athletes at PB Karsa Mandiri Makassar.

The novelty of this study lies in: (1) Development and implementation of portable, visual-based hydration education media that is contextualized to the characteristics of adolescent athletes, (2) Integration of a behavioral education approach with practical hydration indicator evaluation (urine color scale) in field intervention design, and (3) Empirical contribution to the Indonesian sports science literature regarding promotive-preventive strategies in hydration management for school-age athletes.

Theoretically, this study strengthens the multidisciplinary approach between exercise physiology and visual learning theory. Practically, the research results are expected to serve as a simple, applicable, and replicable hydration education model for school sports clubs and early childhood development. Thus, this intervention is oriented not only towards increasing knowledge but also towards sustainable changes in hydration behavior to support athlete performance and health.

METHODS

This study employed a quantitative approach using a pre-experimental one-group pretest–posttest design to evaluate the effectiveness of fan educational media in improving hydration knowledge and hydration status among adolescent athletes. The pre-experimental design was selected to examine causal tendencies in a natural training setting where randomization and control groups were not feasible, particularly in community-based sports contexts (Creswell & Creswell, 2018; Ary et al., 2019). Although this design has internal validity limitations, it is widely used in health education intervention studies to assess short-term behavioral and cognitive changes (Harris et al., 2016; Shadish et al., 2017).

The study was conducted from October 17–25, 2025, at PB Karsa Mandiri Makassar, South Sulawesi. The population consisted of 50 registered badminton athletes. Using purposive sampling, participants were selected based on inclusion criteria: aged 12–17 years, able to read and write, and free from kidney or urinary tract disorders. Athletes with serious injuries or participating in tournaments during the study period were excluded. This age group was targeted because adolescents are physiologically more vulnerable to dehydration due to immature thermoregulatory mechanisms and inconsistent drinking behavior (Bar-David et al., 2015; Kenefick & Sawka, 2018).

The independent variable was hydration education delivered through fan educational media, designed based on multimedia learning principles emphasizing

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concise text, visual reinforcement, and contextual relevance (Mayer, 2020). Visual-based health promotion tools have been shown to enhance retention, attention, and behavioral intention in adolescents compared to conventional lecture methods (Moreno & Mayer, 2016; Hidayat et al., 2022). The fan media contains structured information on hydration definition, physiological functions of water, daily fluid requirements, signs of dehydration, health risks, and preventive strategies aligned with sports hydration guidelines (Casa et al., 2019; Armstrong et al., 2021).

The knowledge variable was defined as athletes' cognitive understanding of hydration concepts. It was measured using a 30-item structured questionnaire with three response options, scored and categorized into good, adequate, and poor levels. Instrument development followed content validity procedures referencing contemporary hydration education frameworks (Baker et al., 2016; Chapelle et al., 2022). The hydration status variable was assessed using a urine color chart with ordinal categorization from pale (well-hydrated) to dark (dehydrated). Urine color assessment is recognized as a practical, non-invasive field method with acceptable validity for monitoring hydration in athletes (Armstrong et al., 2018; McDermott et al., 2017).

The research procedure consisted of preparation and implementation stages. Preparation included ethical clearance, institutional permission, instrument validation, and development of fan educational materials tailored to adolescent athletes' characteristics. During implementation, participants completed the pretest questionnaire, followed by urine color observation under standardized conditions. Subsequently, a 10–15 minute structured hydration education session using fan media was delivered. Posttest measurements of knowledge and hydration status were conducted seven days later at the same training time to minimize circadian and activity-related variability (Wittbrodt & Millard-Stafford, 2018).

Primary data were collected through questionnaires and urine color observation sheets, while secondary data included athlete demographic records from the club. Data processing involved editing, coding, entry, and tabulation. Statistical analysis included univariate descriptive analysis and bivariate inferential testing. Normality was assessed using the Shapiro–Wilk test ($\alpha = 0.05$). If normally distributed, the Paired Sample t-test was applied; otherwise, the Wilcoxon Signed Rank Test was used. These statistical procedures are commonly used to detect mean differences in repeated-measure intervention studies (Field, 2018; Pallant, 2020).

RESULTS AND DISCUSSION

Result

Characteristics of respondents

The respondents in this study were PB Karsa Mandiri Makassar athletes with a total of 25 athletes. The characteristics of the respondents observed were age, gender and education. The description of the respondent's characteristics is presented as follows:

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Table 1.
Characteristics of respondents by age

Age	Frequency (n)	Percentage (%)
12-14	19	76
15-17	6	24
Quantity	**25**	**100**

Table 2.
Characteristics of respondents by gender

Gender	Frequency(s)	Percentage(%)
Male	15	60
Women	10	40
Quantity	**25**	**100**

Table 3.
Characteristics of respondents based on education

Education	Frequency(s)	Percentage(%)
SMP	20	80
SMA	5	20
Quantity	**25**	**100**

Univariate Results

The purpose of this analysis is to provide an overview of the characteristics of respondents and the distribution of values of each variable studied, both before and after educational interventions using fan media.

Table 2.
Athlete's level of knowledge

Knowledge	*Pre-test*		*Post-test*	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Less	10	40	1	4
Enough	10	40	4	16
Good	5	20	20	80
Quantity	**25**	**100**	**25**	**100**

Table 3.
Athlete's Hydration Level

Hydration	*Pre-test*		*Post-test*	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage(%)
Dehydration	4	16	1	4
Adequate hydration	20	80	9	36
Good hydration	1	4	15	60
Quantity	**25**	**100**	**25**	**100**

Bivariate Results

Table 4.
Knowledge Level Data Analysis Results

Knowledge	Frequency (n)	Average (M) ± SD	Significance
Pre	25	64,91 ± 13,11	<0.01
Post	25	92,67 ± 12,45	

Table 5.
Results of Hydration Level Data Analysis

Hydration	Frequency (n)	Average (M) ± SD	Significance
Pre	25	49.82 ± 13.13	<0.01
Post	25	73.04 ± 8.55	

Bivariate analysis was carried out to determine the relationship or difference between two variables, namely before and after educational interventions using fan media**.** The purpose of this analysis was to look at the effectiveness of education on changes in the knowledge level and hydration status of athletes**.** The normality test used is the *Shapiro-Wilk test* because the number of samples is less than 50 respondents.

In this study, bivariate analysis was carried out using *the Wilcoxon Signed Rank Test* because it was not normally distributed. The significance level used is <0.05.

Discussion

Effectiveness of Fan Educational Media in Increasing Knowledge

The findings demonstrate a significant increase in athletes' hydration knowledge following the intervention using fan educational media. This improvement can be explained through both developmental and pedagogical perspectives. The majority of participants were aged 12–14 years, corresponding to early adolescence—a phase characterized by rapid cognitive development, heightened curiosity, and increasing capacity for abstract reasoning (Steinberg, 2017). Adolescents at this stage exhibit strong receptivity to structured health information when delivered in engaging formats. Empirical evidence indicates that nutrition and health education interventions significantly improve knowledge among adolescents when learning materials are age-appropriate and visually stimulating (Nabila & Arnisam, 2022; Chapelle et al., 2022).

Educational interventions are widely recognized as effective tools for correcting misconceptions and strengthening conceptual understanding of health behaviors (Ferdian et al., 2024; Baker et al., 2016). In the context of hydration, improved knowledge enhances individuals' ability to regulate fluid intake according to physiological needs, training intensity, and environmental conditions (Casa et al., 2019; Armstrong et al., 2021). Athletes with adequate hydration literacy are more likely to select appropriate fluid types and maintain sufficient intake to support thermoregulation and neuromuscular function (Sutardi et al., 2023; Kenefick & Sawka, 2018).

The effectiveness of fan educational media can be interpreted through the lens of multimedia learning theory, which posits that the integration of concise text and visual elements enhances information retention and cognitive processing (Mayer, 2020; Moreno & Mayer, 2016). Visual stimuli increase attention span, facilitate encoding into long-term memory, and improve recall compared to text-only methods. Similar findings have been reported in community-based interventions using custom fan media, where significant increases in health knowledge were observed due to the media's portability, creativity, and repeated exposure effect (Asikin et al., 2024). Contemporary health promotion research further confirms that innovative visual tools enhance engagement

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and comprehension among adolescents (Fatima et al., 2021; Hidayat et al., 2022). Thus, the increase in knowledge observed in this study aligns with evidence that accessible, contextually designed media substantially improves adolescent health literacy.

Effectiveness of Fan Educational Media in Improving Hydration

Beyond cognitive gains, this study revealed a statistically significant improvement in hydration status after the intervention ($p < 0.01$). This finding suggests that the educational program not only increased knowledge but also influenced behavioral change an essential outcome in health promotion. Behavioral theories assert that knowledge acts as a precursor to attitude formation and subsequent behavioral modification (Naulia et al., 2021; Riskawaty, 2022). In sports settings, enhanced hydration awareness often translates into proactive behaviors such as carrying personal water bottles, drinking before thirst onset, and monitoring urine color (McDermott et al., 2017; Wittbrodt & Millard-Stafford, 2018).

The relationship between knowledge improvement and hydration status is supported by physiological evidence. Dehydration exceeding 2% body mass impairs endurance, muscle performance, reaction time, and concentration (Judelson et al., 2019; Deshayes et al., 2020). Regular hydration supports cardiovascular efficiency, thermoregulation, and metabolic processes necessary for optimal athletic performance (Armstrong et al., 2021; Casa et al., 2019). In adolescent athletes, who are particularly susceptible to fluid imbalance due to high activity levels and immature thirst regulation, structured hydration education is especially critical (Bar-David et al., 2015; Kenefick & Sawka, 2018).

Environmental and activity-related factors also contribute to hydration risk. High-intensity physical activity increases sweat rate and electrolyte loss, necessitating structured fluid replacement strategies (Zulkarnain et al., 2020; Zahra & Muhlisin, 2020). Without adequate hydration, athletes may experience fatigue, impaired concentration, and increased injury risk (Japeri et al., 2022). The observed shift from underhydrated to well-hydrated categories among participants reflects the practical impact of education in modifying daily drinking patterns.

The design characteristics of fan media further explain its behavioral effectiveness. As a portable, concise, and repeatedly accessible visual tool, it reinforces key hydration messages beyond the initial session. Repeated exposure strengthens message retention and facilitates habit formation (Pakpahan et al., 2021; Gucci et al., 2025). Participatory and contextual educational strategies have consistently demonstrated effectiveness in improving preventive health behaviors among adolescents (Rombeallo et al., 2025).

Overall, the findings indicate that fan educational media represents a simple yet strategically powerful intervention. By integrating cognitive reinforcement with behavioral cues, it bridges the gap between knowledge acquisition and practical hydration behavior, ultimately supporting athlete health and performance sustainability.

CONCLUSION

This study concludes that hydration education delivered through fan educational media is empirically effective in improving both hydration knowledge and hydration

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status among adolescent athletes at PB Karsa Mandiri Makassar. Prior to the intervention, a considerable proportion of athletes demonstrated low to moderate understanding of hydration principles and exhibited suboptimal hydration status, reflecting inadequate fluid management practices during training. These findings are consistent with contemporary literature indicating that adolescent athletes are particularly vulnerable to dehydration due to high physical demands, immature thirst perception, and limited health literacy (Kenefick & Sawka, 2018; Armstrong et al., 2021).

The significant post-intervention improvements suggest that visually engaging, portable, and contextually tailored educational media can enhance cognitive comprehension and facilitate positive behavioral change. The increase in knowledge appears to have been translated into improved drinking practices, supporting evidence that structured health education influences preventive behaviors and physiological outcomes (Casa et al., 2019; Wittbrodt & Millard-Stafford, 2018).

Therefore, integrating innovative, youth-oriented educational strategies into sports training programs is essential to promote sustainable hydration habits. Such interventions not only strengthen athletes' health literacy but also contribute to optimizing performance, recovery, and long-term athletic development.

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This study was conducted with the awareness that improving adolescent athletes' hydration literacy is an important component of preventive sports health strategies. Therefore, we appreciate all stakeholders who support the integration of scientific findings into real training environments. It is hoped that this collaboration will continue to foster research-based innovation in sports education and contribute to the advancement of athlete health, performance, and sustainable development in youth sports programs.

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