

Original article:

**Developing Information media as Dehydration Prevention Strategy
In Indonesia Recreational Futsal Players**

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Abstract:

Background: Futsal as leisure time sport is very popular in Indonesia. However, this sport is characterized by high intensity which tends to cause dehydration. **Aim:** The aim of this study was to identify pre-exercise hydration status of recreational futsal players and develop information media to prevent dehydration in Indonesia recreational futsal players. **Method:** Descriptive cross-sectional study was implemented as part of preliminary study to get the picture of pre-exercise hydration status of recreational futsal players. Twenty seven male participants were recruited in this study (age 22 + 3.19 years old., weight 65.85 + 13.54 kg, height 1.69 + 0.08 m, BMI 22.73 + 3.08 kg/m²). Hydration status was checked by using urine strip test before they played futsal. Participants filled out short questionnaires to find out the information source of dehydration. Information media was created based on the result of this preliminary study to prevent dehydration. Additionally, media expert and sports medicine doctor also assessed the development of information media. **Result:** The preliminary study showed that 77.7% (n = 21) of the subjects suffered from dehydration before playing futsal. The short questionnaires result showed that most of the subjects received information about dehydration from television (52%) and internet (43%). The content and design of developed information media was considered valid by the experts. **Conclusion:** Our findings conclude that incidence of pre-exercise dehydration among recreational futsal players in Indonesia was high. Further study to evaluate the use of developed information media is needed to prevent the risk of dehydration during high intensity exercise.

Keywords : prevention; dehydration; futsal; recreational sport; information media.

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Introduction

Exercise is essential for a healthy life. Physical inactivity has clearly been shown to be a risk factor for non-communicable chronic diseases such as coronary heart disease, stroke, hypertension and diabetes mellitus type 2.¹ Promoting healthy lifestyle such as leisure time physical activity is important to enhance the quality of life. Lin et al² showed that

leisure time physical activity have beneficial effect on cardio-metabolic health in large population.

Futsal or indoor soccer is a popular leisure time sport in Indonesia. This kind of sport has become a trend and lifestyle especially in youth community. Leisure time sport or called recreational sport means that the sport played not for competitive reason but as a leisure time activity for recreational purposes. Data

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from google trend has shown that Indonesia is on the second place worldwide, after Portugal, in using “futsal” search term.

As a recreational sport, futsal is played mostly in the afternoon or evening after finishing daily work. This ‘after work’ time of doing sport is predicted to make the players to be more susceptible to dehydration. Moreover, futsal is considered as a high intensity sport that might lead to severe fluid loss of our body through sweating.^{3,4,5} Dehydration could decrease sport performance and cognitive ability, especially when the dehydration level exceeds 2%.^{6,7,8} The declining cognitive and concentration functions would make a player perform wrong moves or techniques and become less responsive to the game that could lead to injuries.

This concern is supported by another fact that futsal has high incidence of injuries.^{9,10} Study from Rodrigo et al¹¹ has shown that the incidence of injuries among futsal players with younger age is higher than senior players due to wrong techniques and low musculoskeletal fitness. The risk becomes higher since most recreational futsal players’ knowledge about body fluid needs and prevention of dehydration is inadequate. This could happen because they do not have personal trainers, doctors or nutritionist compared to the professional athletes. Regarding the tendency of dehydration occurred among recreational futsal players and high incidence of injuries in this sport, the strategy to prevent dehydration is needed by providing information about fluid intake requirements before, during, and after exercise.

This study aims to identify the pre-exercise hydration status among recreational futsal players and develop suitable information media to prevent dehydration.

Materials and Methods

Participants

Young recreational futsal players were recruited in the preliminary study by purposive/judgmental sampling to the amateur futsal team in Yogyakarta, Indonesia. There were 27 young recreational futsal players who met the criteria participated in this study. The inclusion criteria were (1) male, aged 18-25 years old; (2) high school or college students; (3) had community/recreational futsal team; (4) only played futsal for leisure time activity; (5) were not registered as official player in any professional league and/or university futsal competitions; (6) regularly played futsal for at least 1 time per week, and (7) had passed medical screening. Medical screening was conducted by a medical doctor to ensure that subjects were not having health problems or consuming substance/

medication, such as diuretics (caffeine, furosemide), that might alter urine specific gravity within the last 48 hours.

Assessment of Hydration Status

The assessment of hydration status was carried out to all subjects before playing futsal. Subjects were asked to collect their urine sample 15-30 minutes before start the game. Although subjects knew the purpose of the study, they were not told the detail of the research before data collection, so they did not change their hydration habit.

Dehydration level was measured using urine strip test. The value of urine specific gravity resulted from the urine strip test was compared to the reference value:

Table I. Reference value of Urine Specific Gravity¹²

Hydration Status	Urine Specific Gravity
euhydration/good hydration	< 1.010
minimal dehydration	1.010 – 1.020
significant dehydration	1.021 – 1.030

Subjects answered the questions in the questionnaires to identify how they received information about hydration.

Developing Hydration Information media

Hydration information media was developed to increase the knowledge of recreational futsal players about fluid intake in sports. The content was validated by sports medicine doctor while its graphic design was validated by information media experts. Expert scored from 0-5 (very poor, poor, fair, good, very good) for each aspect that included (1) contextual truth (2) sentence structure (3) design and (4) graphic aspect.

Data Collection and Analysis

Both baseline (e.g. name, birthdate, address, age, height, weight), urine strip test result and questionnaire data were collected by the same trained staff. The collected data was tabulated and presented using SPSS 22.00 software.

Ethical clearance: All subjects signed an informed consent form and this research was approved by university’s review board (Universitas Negeri Yogyakarta, Indonesia).

Results

Participants

Total of 27 subjects were participated in the

preliminary study. Table-II represent characteristics of the subjects.

Table II. Subjects characteristics.

Characteristics	Subjects (n=27)
Age (year)	22 ± 3.19
Weight (kg)	65.85 ± 13.54
Height (m)	1.69 ± 0.08
BMI (kg/m ²)	22.73 ± 3.08

Hydration Profile of Subjects

The result of urine strip test showed that 22.2% (n = 6) subjects had good hydration (euhydration) and 77.7% (n=21) suffered dehydration before playing futsal. There were 15 from 21 subjects with dehydration were categorized into minimal dehydration and the rest 6 subjects were significant dehydration (table III).

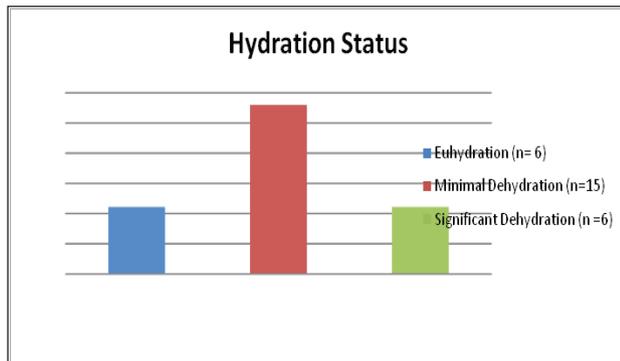


Table III. Hydration Status

Two out of 27 subjects refused to fill out questionnaires, resulting 25 sets completed questionnaires. The results showed that 21 subjects ever heard about hydration and 4 subjects never heard about hydration (table IV). From 21 subjects who got information about hydration, most of them got the information from television (52%; n= 11) and internet (43%; n = 9) as presented in table V.

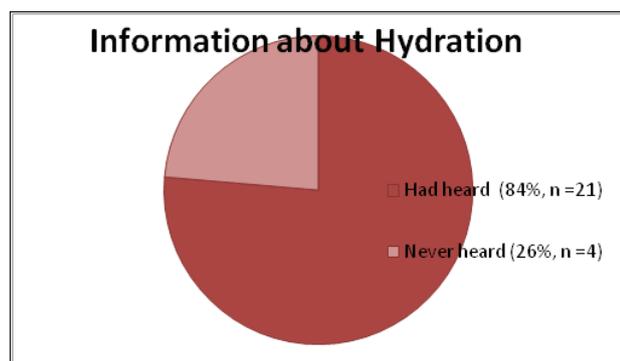


Table IV. Information about hydration

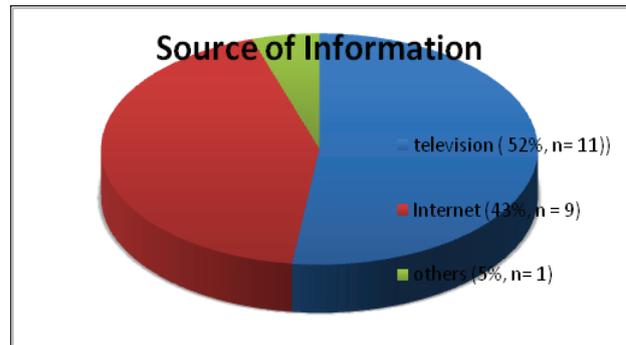


Table V. Information source about hydration
Hydration Information media

We had developed information media to prevent dehydration, consisted of information about (1) suggestion to monitor hydration status during exercise (2) facts of dehydration occurred among futsal recreational players (3) ways to monitor dehydration status using the color of the urine (4) recommendations to fulfill minimum fluid needs before, during, and after exercise. Digital image format was selected for the information media since it was easy to share on social media such as WhatsApp, Facebook, Instagram, Twitter, or even to print it out to be poster. The product of information media was shown in figure 1.

The expert persons were provided an assessment of the developed product. Sports medicine doctor scored 4.30 and media expert scored 4.67 out of 5. The information media categorized as “good-very good” and it was considered feasible to community trials.

Discussion

The result of preliminary study showed that majority of recreational futsal players in Indonesia were dehydrated (77.7%) before playing futsal, either in minimal or significant dehydration. Futsal is high intensity sports that could cause severe fluid loss from sweating. Research from Jimenez et al¹³ showed that average fluid loss through sweating during futsal was between 2450 ± 775 ml for field players and 2195 ± 558 ml for goal keeper. Although the level of fluid loss in recreational futsal players was lower than professional players, starting to play futsal in dehydrated condition would worsen the hydration status. Research from Cleary et al¹⁴ implied that dehydration condition among young athletes were still occurred even when the chance to have unlimited time to drink (*ad libitum*) had been given. In addition, other research by Usfar¹⁵ revealed that the level of awareness to drink among Indonesian youth was low. Fluid is indispensable in maintaining our body temperature. Once body temperature is higher

ARE YOU HYDRATED ENOUGH? CHECK YOUR URINE COLOR

7 of 10 futsal players are in danger of dehydration!



URINE COLOR CHART

- GOOD HYDRATION
- MILD DEHYDRATION
- SEVERE DEHYDRATION

Dehydration can cause:

- Decrease on your futsal performance
- Decrease your concentration that can cause other musculoskeletal injuries
- Make you more susceptible to exertional heat illnesses (eg. heat cramps, heat exhaustion, heat stroke)

1 BEFORE FUTSAL
Check your hydration status!
2-3 hours before : drink 3-4 cups of water.
10-20 minutes before : drink 1-2 cups of water.

2 DURING FUTSAL
Drink 1-2 cups of water in every time outs and match break.
Drink more when the weather is hotter than usual.
Choosing sports drink will be better.

3 AFTER FUTSAL
Keep hydrate at least until 2 hours after the game.
Continue to drink 2-6 cups of water
Re-check your hydration status

Drink now!
get the risks of dehydration decrease
AND ENJOY YOUR FUTSAL GAMES!



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Figure 1. Research product : information media of hydration.

than normal, our body will release the heat to the environment then decreasing the body temperature back to normal condition.¹⁶ In high intensity sports such as futsal, basal metabolic rate increases to 20-25 times higher resulting increased body temperature to 0.1°C in every 5 minutes. Sweat production is one of our body mechanisms to take out the heat, meanwhile it will also reduce fluid level and electrolyte in our body. Once the sweat is left unreplenish, it will cause dehydration.¹⁷ Another issue of the dehydration condition are muscle cramp and heat exhaustion. Loss of fluid in our body more than 2% can also lower cognitive functions such as perception and reflex that can lead to greater chance of injuries.¹⁸ The knowledge level of hydration was strongly related to information obtained. The provision of information about hydration would increase the level of knowledge in the community compared to those with no information at all.¹⁹ Information sharing was needed, even for both elite and students athletes, the knowledge level was still low.^{20,21} This study also showed that there were 84% of the subjects claimed that they received information about hydration, but 77.7% of the subjects were still dehydrated before doing sports. Some possibility can be its causes, such as (1) the information was still very superficial and inapplicable and (2) the level of awareness to fulfill fluid requirement was low although they had the knowledge. Based on the result of this study, it is important to educate people about fluid intake during sport, in accordance to National Athletic Trainers Association (NATA) and American College of Sports Medicine (ACSM) recommendation.^{12,18,22} Recommendation of fluid intake in sport can be applied before, during and after the game. To get good hydration for our body, it is suggested to drink 2-3 glasses of fluid (500-600 ml) for 2-3 hours before exercise and 1-2 glasses (200-300 ml) of fluid for 10-20 minutes before game started. To maintain fluid balance while exercise, it is recommended to consume fluid as much as 1-2 glasses of fluid (200-300 ml) every 10-20 minutes. Not only that, rehydration process also needed up to 2 hours after exercise. Recommended drinking fluid temperature is 10-16°C. The cool fluid will influence the number of fluid consumed, the athletes tends to be drink more amount of fluid when it served cool.²³ The education instrument is expected to change the attitudes and achieve desired results.^{20,21} Research by Cleary et al¹⁴ showed that education could improve the hydration status of athletes while training. Prevention of dehydration through increasing awareness to drink

required cooperation from all related stakeholders such as athletes, coaches, training center managers, and sport competition organizers.^{14,24,25} This study also showed that majority of the subjects received information about hydration from television (52%, n = 11) and internet (43%, n = 9). This phenomenon was easily understood, since some TV commercials showed products for hydration and access of internet are easily get nowadays and commonly used. In the developed countries, the number of internet users reaches 86% of youth and 72% of them use the internet to get the information about health.²⁶ Information media was developed based on the result of preliminary study. Design with blue background and silhouette of futsal player was created to attract recreational futsal players' attention in fulfilling fluid needs when exercise. Blue is basic color of International Federation of Football and Futsal (The Federation Internationale of Football Association/FIFA) and identical with fluid color. The recommendation to drink more fluid was informed together with facts from the earlier studies that 7 of 10 recreational futsal players were dehydrated before futsal. Players' hydration status monitoring was informed through comparing their urine color to the color on the picture. Urine color is simple and reliable method to assess their hydration status. Clear yellowish color indicated good hydration status, meanwhile brownish gradation indicated the level of dehydration occurred.¹² The last part of the design was the analogue clock picture that shows timeline and recommendation of fluid consumption before, during and after exercise.^{12,18} The strength of this information media was comprehensive and the recommendation was sport time specific. This media not only provided the way to monitor dehydration from urine color, but also gave the solution of this matter, so that it was comprehensive. The recommendation of fluid intake around sport time and other things needed to be done were given not only in general, but also for every specific time in exercise (before, during and after exercise). Expert persons were sports medicine doctor and media expert to evaluate the draft of the developed information media. Sports medicine doctor evaluated the compatibility of the design with literature review, evidence-based content, additional information needed, and sentence structure. Media expert evaluated the graphic aspect such as the sequence of presentation, design, layout, font size,

interactivity, and comprehensiveness. Each expert scored 0-5 (very poor-very good) and the product was considered feasible by the experts to community trials (average score 4.48 out of 5.00 means good-very good).

This information media was using digital image format because the questionnaire data result showed that 95% of the subjects received information from digital visual media (television and internet). Digital image format was considered effective since it was easy to share in internet and social media. Moreover, it was supposed to be more economical to be disseminated compared with other printed media such as posters or billboard.

A research by Chapman et al²⁶ acclaimed that using social media for delivering health information was effective, especially when two ways of communication could be established. Community members could be targeted to give real time feedback, such as suggestions, sharing perception, thoughts, as well as issues²⁷. Specific selection of futsal communities would make the promotion get the right target and be more cost efficient.

Conclusion

Incidence rate of pre-exercise dehydration was high among Indonesian recreational futsal players. Providing information about hydration status monitor and fluid intake recommendation in sports is needed to prevent dehydration. This study had developed the information media about hydration by

collaborating with related experts. Further research to disseminate this product in internet and social media for specific communities and well targeted people is required to evaluate the effectiveness of dehydration prevention program.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Authors' Contribution

Muhammad Ikhwan Zein: Research leader, built the design of the research, data collection and coordination.

Saryono Saryono: participated in study design, data collection and statistical analysis.

Endang Rini Sukamti : participated in literature review and discussion.

Rumpis Agus Sudarko : participated in literature review and discussion.

Ukhti Jamil Rustiasari : participated in data analysis and literature review.

Syefudin Ali Akhmad : participated in data analysis and final editing manuscript.

Alvin Wiharja : participated to draft the manuscripts, providing english language correction.

Anita Suryani : participated to draft the manuscripts, Final editing manuscript

References:

1. Gonzales K, Fuentes J, Marques JL. Physical Inactivity, sedentary behavior and chronic disease. Korean J Fam Med 2017;38(3):111-5. <https://doi.org/10.4082/kjfm.2017.38.3.111>
2. Lin X, Alvim SM, Simoes EJ, Bensenor IM, Barreto SM, Schmidt MI, Ribeiro AL, Pitanga F, Almeida MC, Liu S, Lotufu PA. Leisure time physical activity and cardio-metabolic health : results from the Brazilian longitudinal study of adult health (ELSA-Brasil). J Am Heart Assoc 2016 Jun 13;5(6). <https://doi.org/10.1161/JAHA.116.003337>
3. Barbero-Alvarez JC, Soto VM, Barbero-Alvarez V, Granada-Vera J. Match analysis and heart rate of futsal players during competition. J Sports Sci 2008 Jan 1;26 (1):63-73. <https://doi.org/10.1080/02640410701287289>
4. Montain SJ, Chevront SN, Lukaski HC. Sweat mineral element responses during 7 h of exercise-heat stress. Int J Sport Nut Exerc Metab 2007 Dec; 17(6):574-82 <https://doi.org/10.1123/ijsnem.17.6.574>
5. Deuster PA, Zeno SA, Attipoe S. Basic in sports nutrition. In :O'connor FG, Casa DJ, Davis BA, Pierre PST, Sallis RE, Robert PW, editors. ACSM's sports medicine a comprehensive review. Philadelphia : Wolters Kluwer Health/Lippincott Williams&Wilkins; 2013.p. 69.
6. Bardis CN, Kavouras SA, Arnaoutis G, Pan-

- agiotakos DB, Sidossis LS. Mild dehydration and cycling performance during 5-kilometer hill climbing. *J Athl Train* 2013;48(6):741-747. <https://doi.org/10.4085/1062-6050-48.5.01>
7. Casa D. Exercise in the Heat. I. Fundamentals of thermal physiology, performance implications, and dehydration. *J Athl Train* 1999;34(3):246-252.
 8. Armstrong LE, Johnson EC, Kunces LJ, et al. Drinking to thirst versus drinking ad libitum during road cycling. *J Athl Train* 2014;49(5):624-631. <https://doi.org/10.4085/1062-6050-49.3.85>
 9. Junge A dan Dvorak J. Injury risk of playing football in futsal world cups. *Br J Sports Med* 2010;44(11):787-793. <https://doi.org/10.1136/bjism.2010.076752>
 10. Schmikli SL, Backx FJ, Kemler HJ, van Mechelen W. National survey on sports injuries in the Netherlands: target populations for sports injury prevention programs. *Clin J Sport Med* 2009;19:101-6. <https://doi.org/10.1097/JSM.0b013e31819b9ca3>
 11. Rodigro NR, Leonardo OPC. Epidemiologic analysis of injuries occurred during the 15th Brazilian indoor Soccer (futsal) sub20 team selection championship. *Rev Bras Med Esporte* 2006;12:1-5.
 12. Casa DJ, Armstrong LE, Hillman SK, et al. National athletic trainers' association position statement: fluid replacement for athletes. *J Athl Train* 2000;35(2):212-224.
 13. Jimenez JVG, Lucas JLY, Pellicer JGG. Fluid balance and dehydration in futsal players : goalkeepers vs field players. *Rev.int.cienc.deporte* 2011;22(7):3-13. <https://doi.org/10.5232/ricyde2011.02201>
 14. Cleary MA, Hetzler RK, Wasson D, Wages JJ, Stickley C, Kimura IF. Hydration behaviors before and after an Educational and prescribed hydration intervention in adolescent athletes 2012;47(3):273-281. <https://doi.org/10.4085/1062-6050-47.3.05>
 15. Usfar AA, Fahmida U. Do Indonesians follow its dietary guidelines ? - evidence related to food consumption , healthy lifestyle , and nutritional status within the period 2000-2010. 2011. *Asia Pac J Clin Nutr* 2011;20(13):484-94.
 16. Foss ML, Keteyien SJ. *FOX's Physiological Basis for Exercise and Sport* 6th edition. Boston : WCB/McGraw-Hill;1998.
 17. Murray RS, Udermann EB. Fluid replacement : a historical perspective and critical review. *International Sports Journal* 2003;7 (2):58-64.
 18. Sawka, M.N.; Burke, L.M.; Eichner, E.R.; Maughan, R.J.; Montain, S.J.; Stachenfeld, N.S. Exercise and fluid replacement. *Medicine and Science in Sports and Exercise* 2007;39(2):377-390. <https://doi.org/10.1249/mss.0b013e31802ca597>
 19. Torres-mcgehee TM, Pritchett KL, Zippel D, Minton DM, Cellamare A, Sibilia M. Sports nutrition knowledge among collegiate athletes, coaches, athletic Trainers, and strength and conditioning Specialists. *J Athl Train* 2012;47(2):205-211. <https://doi.org/10.4085/1062-6050-47.2.205>
 20. Esa NH, Saad HA, Phing CH, Karppaya H. Knowledge, attitudes and behaviours regarding hydration and hydration status of Malaysian national weight category sports athletes. *J Phys Educ Sport* 2015;15(3):452-459.
 21. Sobana RM, Nirmala MJ. Analysis of knowledge, attitudes and practices between male and female college athletes on hydration and fluid replacement. *Int J Sport Sci Fit* 2014;4(2):144-156.
 22. Casa DJ, DeMartini JK, Bergeron MF, et al. National athletic trainers' association position statement: Exertional heat illnesses. *J Athl Train*. 2015;50(9):986-1000. <https://doi.org/10.4085/1062-6050-50.9.07>
 23. Hosseinlou A, Khamnei S, Zamanlu M. The effect of fluid temperature and voluntary drinking on the post rehydration sweating. *Int J ClinExp Med* 2013;6(8):683-687.
 24. Tan CM, Tan IW, Kok WL, Lee MC, Lee VJ. Medical planning for mass-participation running events: a 3-year review of a half-marathon in Singapore. *BMC Public Health* 2014;14(1):1109. <https://doi.org/10.1186/1471-2458-14-1109>
 25. Casa DJ. "Hydration and heat illness guidelines," 2006: 1-6. Downloaded http://www.ayso85.org/r85/coach/st-Content.jsp_51-MedInfo01.pdf.
 26. Chapman B, Raymond B, Powell D. Potential of social media as a tool to combat foodborne illness," *Perspect Public Health* 2014;134(4):225-231. <https://doi.org/10.1177/1757913914538015>
 27. Basu, P., Chakrabarty, A., Bhattacharya, S., Bhattacharya, K., Dasgupta, U., Bhattacharya, S., & Ali, K. (2019). Assessment on the awareness level about diarrhoea and its management among mothers attending outpatient department in a rural hospital of West Bengal, India. *Bangladesh Journal of Medical Science*, 18(2), 267-273. <https://doi.org/10.3329/bjms.v18i2.40696>