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ORIGINAL RESEARCH

Development of a water drinking schedule for athlete using an android mobile application

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Abstract

Water has an important role for human health because human body parts are in the form of liquids, so humans are required to consume drinking water regularly. This study aimed to develop a schedule for drinking water to meet the fluid needs of athletes based on an Android mobile application. This study used the 10-step development research model developed by Borg and Gall. The product developed in this study was validated first by material and media experts. The results showed that the percentage of the material expert's assessment was 79%, which was in the feasible category, and the media expert's assessment was 96%, which was in the appropriate category. After it was declared feasible, this product was tested on large and small groups based on trials that had been carried out showing that it was feasible. The final product in this study is the Minum Kuy application, which is a reminder application to drink water and controls the amount of water that is drunk every day.

Keywords: Android, drinking schedule, water.

Introduction

Water is the most important component of the human body. The human body is approximately 75% water, but the percentage of water in the human body decreases with age (Ignatov et al., 2015). The human body depends heavily on the element water. The chemical formula is made up of two hydrogen atoms linked to one oxygen atom. H2O, so water is a very important compound for the body (Lalage, 2019). The body needs water for digestion, to absorb nutrients, remove waste products, regulate body temperature, break down organic and inorganic materials, lubricate joints and internal organs, and give structure to cells and tissues (Australia, 2022; Jéquier & Constant, 2010). The need for water in the human body can increase under certain circumstances, for example, under conditions of fever, physical activity, or high environmental temperatures where the human body becomes thirsty (Mantarisa, 2011). Furthermore, according to Andayani & Dieny (2013), a person's water needs are influenced by age, gender, environmental temperature, physical activity, physical size, and nutritional status. In addition, everyone's humidity needs are different, depending on the conditions in which they live and their activities.

Young athletes today train and compete in environments that jeopardize the fluid balance in their bodies, and hypohydration is frequently a big concern. Hyperhydration is another uncommon illness that, when combined with other risk factors, can result in hyponatremia (Meyer et al., 2012). Further found that as many as 73.5% of adolescent athletes consume too few fluids (Indrawati et al., 2017). Athletes who start their training or competition with good body hydration will have better endurance, reaction speed, and sports performance (Hidayati, 2015). Controlling fluid intake is one strategy to prevent dehydration because physical activity increases the body's requirement for fluids, which must be met while exercising in order to maintain fluid balance. Consuming 600–1500 mL of mineral

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water with a concentration of 4–8 percent per hour will assist maintain fluid balance and restore energy lost during physical exercise. This water should also have a combination of water, electrolytes (such as sodium, potassium, and magnesium), and glucose. Controlling fluid intake is one strategy to prevent dehydration because physical activity increases the body's requirement for fluids, which must be met while exercising in order to maintain fluid balance. Consuming 600–1500 mL of mineral water with a concentration of 4–8 percent per hour will assist maintain fluid balance and restore energy lost during physical exercise. This water should also have a combination of water, electrolytes (such as sodium, potassium, and magnesium), and glucose (Dieny & Putriana, 2015; Irawan, 2007). Athletes are advised to regularly consume 100-200 mL of cold water every 10-15 minutes while competing, however this recommendation may vary depending on the particular athlete's requirement for additional fluids to maintain appropriate hydration (Irianto, 2017).

Adequacy of fluids in the body is very influential for stabilizing body components. If you lose more body fluids than you take in, you will become dehydrated. Dehydration results in certain body functions, such as fatigue and muscle spasms, lower movement coordination, difficulty concentrating, increased body temperature, and tiring quickly (Ashadi, 2015); thus, athletes run sub-optimally. However, if the body is properly hydrated, the adequacy of water in the body can maintain and stabilize blood flow, lubricate joints and body tissues, facilitate the digestive process, and so on. Based on preliminary studies that have been conducted on athletes of the Sports Education FKIP University of Riau, in 40.8% of respondents, the amount of water that is drunk per day is not in accordance with health recommendations, which is as much as 2 liter per day. From these observations, there was a problem faced by athletes namely the lack of their awareness regarding the importance of drinking water regularly. Thus, we wanted to provide a solution so that athletes can maintain their condition and fitness by drinking clean water sufficiently and regularly both before and after exercise, or even in a non-exercise condition.

Referring to the problems that have been described previously, the aim was to design an Android-based application to obtain a solution so that the athletes know the minimum target amount of water that must be drunk and always obtain a warning to drink water throughout the day. Therefore, we are interested in conducting a study on the "Development of a water drinking for athlete schedule using an android mobile application".

Methods

This research was based on the research and development model by Gall et al., (2007) in which there are ten activities/stages. Based on the 10 development steps developed by Borg and Gall, we adopted the following stages: a) preliminary study; b) preparing the plan; c) initial product development; c) conduct small group trials; d) product Revision; e) large group trial; f) product revision. Adapted from the stages of research and development by Borg and Gall, this study was conducted to develop a water drinking schedule designed for athletes using an android mobile application. The app was developed to remind users to drink water and suggest the amount of water to drink each day.

Participants

The subjects in this study consisted of one media expert, one material expert, 27 student athletes of the Sports Education FKIP University of Riau (preliminary study), 9 student athletes in the Department of Sports Education FKIP University of Riau (small group trial), and 30 respondents from student athletes in the Department of Sports Education, FKIP University of Riau (large group trial). The qualitative data analysis technique in this used a statement with a Likert scale with a scale of 4, namely worthy, decent enough, less worthy, and not worthy, if the results of the assessment are included in the feasible category, it means that the product is eligible to be tested at a later stage.

Procedure

This research adapts the development model from Gall et al., (2007) into 7 steps, the development research procedure in this study is as follows:

1) *Preliminary Study:* In the preliminary study, researchers made observations by distributing questionnaires to 27 Sports Education students of FKIP Universitas Riau.

2) *Planning:* After collecting data from observations, researchers plan and design the development of an *Android-based* water drinking schedule reminder application that will be made.

3) *Initial product development:* Consultation is carried out with media experts for the creation of application media. After getting information about making application media, researchers collected tools and media creation processes. After the production is

complete, then validate it by media experts and material experts. The researcher then made revisions based on suggestions and input from material experts.

4) *Conduct small group trials:* The revised facilities based on the advice of media experts and material experts were then tested in small groups using trials to sports players, especially coaches, were also distributed questionnaires to obtain data that was used as material for the next stage of revision.

5) *Product revisions:* Based on the results of small group trials, the data is then used as a reference in revisions and then improvements are made which are then used in operations (large groups).

6) *Field trials:* The revised application media

based on trials is then tested in the operational group. Just like the main initial group trial, trainers were distributed questionnaires to obtain data that was used as material for subsequent media revisions.

7) *Final product revision:* The data from the main field trials is used as reference material in product revisions and is the final result in the development of a reminder application media for drinking water during the COVID-19 pandemic based on an android mobile application. The final application has been revised as shown below.

Data Analyses

The feasibility test data for the Minum Kuy application that were obtained from the results were filled in by the respondents using a score in the form of quantitative data, which was converted to the scale of four in the form of qualitative data.

Results

The results in the study are in the form of the "Minum Kuy" application which has been validated by two experts, namely one material expert and one media expert. The percentage obtained from the first stage of material expert assessment obtained by providing product revisions is 75%, which falls into the category of feasible enough to be carried out in the second stage of validation. Furthermore, the results validation from the first stage of media experts obtained by providing product revisions in Table 2, the percentage obtained is 76%, which is included in the feasible category. However, the pedagogic aspect is still in the Less Feasible category and the technical aspect is still in the Decent Enough category so it needs to be carried out in the second stage of validation. The results of the assessment of material experts and media experts are presented. The validation data for "Minum Kuy" from the results of the first stage of material expert validation in Table 1 and the first stage of media expert validation in Table 2 can be seen.

Table 1

Material expert first stage validation.

Rated aspect	Score	%	Category
Design	36	80	Worthy
Contents	32	71	Decent enough
Technical	26	74	Decent enough
Total Score	94	75	Decent enough

Table 2

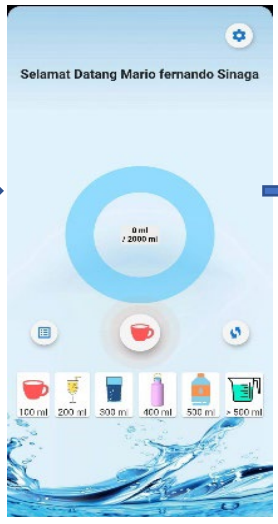
Media expert first stage validation.

Rated aspect	Score	%	Category
Design	44	88	Worthy
Pedagogic	27	54	Less worthy
Contents	24	96	Worthy
Technical	26	69	Decent enough
Total Score	121	76	Worthy

After obtaining the results of the validation of the first stage of material experts and media experts, the second stage of material expert data collection "Minum Kuy" will be carried out. In the second stage of validation in Table 3, the percentage of value obtained is 79%, thus it can be stated that according to material experts at the validation stage of the development of the second "Minum Kuy" and all aspects assessed get the decent category. Data collection continued with the second stage of media expert validation in table 4, as for the data on the results of "Minum Kuy" from the second stage media expert, the percentage of value obtained was 96%, thus it can be stated that according to media experts at the second stage of validation of the development of "Minum Kuy" and all aspects that were assessed received the feasible category. The validation data for "Minum Kuy" from the results of the second stage of material expert validation in Table 3 and the second stage of media expert validation in Table 4 can be seen. In the second stage of validation, the percentage of the value obtained is 96%, thus it can be stated that according to media experts at the second stage of validation of the development of "Minum Kuy" and all aspects considered to be eligible.

Registration/log-in using the email on the user's smartphone.

After logging in, there will be content about the benefits of drinking water and the impact if you don't drink enough.



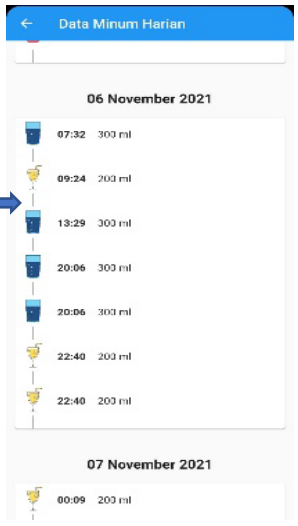
The main page allows selection of the size of a glass according to the size used by the user.

Click on the picture of the glass, then a confirmation message will appear. If you have drunk, click "yes, of course" and if not, click "cancel".

If you have confirmed that you have been drinking water, then the history will be recorded in the drinking history.

Next is settings menu, which is shown in the upper right corner.

Notification settings in the upper right corner of the homepage to set the required reminders.



Daily drinking data to view drinking data while using the "Minum Kuy" application.

Figure 1. Display of the Minum Kuy Application.

After the product developed has been declared feasible by material experts and media experts, the product is feasible for the next stage, namely small group and large group trials. In a small group trial, researcher direct research subjects and respondents to use the application starting from the beginning of the subject and respondents waking up until bedtime. The results of the small group trial show that the score for the product display aspect is 85% which is in the decent category, the product innovation aspect is 84% in the decent category, while the value for the product function aspect is 82% which is the proper category. The total value of the small group trial of this product according to the respondents is 84%, which is included in the feasible category which means that the product is worthy of being tested at the next stage. The next stage of the trial, which was a large group, the results of the respondent's questionnaire test regarding the "Minum Kuy" application product showed that the value of the product display aspect was 87% which was included in the feasible category, the product innovation aspect had a value of 84% which was included in the feasible category, and the product function aspect had a value of 87% which also fall into the eligible category. The total score in the large group trial, which is 86%, is categorized as feasible, which means that the "Minum Kuy" application product is categorized as feasible.

Revisions were carried out after the "Minum Kuy"

application product was given an assessment, suggestions, and criticism regarding the quality of the material and media in the developed product, which were used as a guide for making revisions. Suggestions from material experts include content that is more specific to the target use, then more content was reproduced, the content contained benefits for athletes, and it can be used as a guideline for athletes by using scientific language. Next, suggestions from media experts were on the offering page and added in the application product; we fixed the notification bug, added a button option when one wants to drink, and exited the application.

Table 3
Material expert second stage validation.

Rated aspect	Score	%	Category
Design	36	80	Worthy
Contents	35	78	Worthy
Technical	28	80	Worthy
Total Score	99	79	Worthy

Table 4
Media expert second stage validation.

Rated aspect	Score	%	Category
Design	47	94	Worthy
Pedagogic	47	94	Worthy
Contents	25	100	Worthy
Technical	35	100	Worthy
Total Score	154	96	Worthy

Table 5
Small group trial.

Rated aspect	Score	%	Category
Product Display	115	85	Worthy
Product Innovation	152	84	Worthy
Product Function	111	82	Worthy
Total Score	378	84	Worthy

Table 5
Small large trial.

Rated aspect	Score	%	Category
Product Display	392	87%	Worthy
Product Innovation	502	84%	Worthy
Product Function	392	87%	Worthy
Total Score	1.286	86%	Worthy

Discussion

The final product in this study was the "Minum Kuy" application, which is a reminder application for drinking water and suggest the amount of water drunk every day. In the application, there is content that contains the benefits of drinking water for the body and the impact if the need for drinking water is not fulfilled. To remind the user to drink, there will be a notification on the user's smartphone, and the time interval for the notification can be set by the user.

The product developed was the "Minum Kuy" application, which has been declared suitable for use to help us remember a regular drinking schedule and maintain adequate fluids for the body. The human body can survive weeks without food but only days without water. Given the inability to store water, a fresh supply is required daily to compensate for losses through the skin, lungs, urine, and feces (Shon et al., 2022). While adequate water intake is essential for maintaining good health, most adults do not hydrate at the recommended levels. In addition, in adults, consumption of diuretic beverages, such as caffeinated coffee, tea, and alcohol, is on the rise, resulting in an increased risk of dehydration (Reyes & Cornelis, 2018).

Fluid balance is needed to maintain blood volume and regulate body temperature and is involved in muscle contraction. Sweating is the body's primary way of maintaining optimal body temperature. Consuming fluids to replenish fluids lost during exercise (rehydration) will restore fluids and maintain normal muscle function, help prevent decreased physical performance, and reduce the risk of heat stress in the body. Symptoms of heat stress during exercise can cause hypotension, hyperventilation, vomiting, diarrhea, and seizures. If a person's knowledge about adequate fluid consumption is good, then information about the importance of good water consumption will also affect habits for complying with fluid intake; thus, the body obtains a good hydration status, which will also improve body condition (Trisandi et al., 2016).

Applications like this have also been developed previously in published studies, but these applications have only been intended for the general public, not for athletes. The results of this study are relevant to a previous study entitled "Android-Based Daily Water Consumption Monitoring Application Using Ionic and Laravel in Smart Bottle Design" (Akbar & Oktivasari, 2017). In this study, the Smart Bottle application was able to determine the water requirement for athletes who do strenuous sporting activities 3-4 times a week

which is adjusted based on the profile information of each person who enters when registering a new account. Then the problem of calculating water consumption can be overcome by using water discharge sensor calculation data.

The application designed in this study will be a new breakthrough from prior research that has been carried out (Akbar & Oktivasari, 2017). This application is designed with educational features regarding the benefits of water for the body, calculating the minimum target amount of water that must be drunk, setting the alarm time that will appear for drinking water warnings, and providing a record of the water that has been successfully drunk by the user.

Conclusions

The development of Water Drinking Schedules for Sports Education Athletes to Maintain Body Fitness During the Covid-19 Pandemic Period Based on Android Mobile Applications ware were categorized as suitable for use as a application drinking water schedules. Weaknesses in the "Minum Kuy" application product can only be accessed online, and it can only be used on Android smartphones. Therefore, we suggest to the development of a drinking water reminder application that can also be used offline and can also be used on IOS smartphones.

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