

## **REDUCING THE DEPENDENCY ON RICE AS STAPLE FOOD IN INDONESIA – A BEHAVIOR INTERVENTION APPROACH**

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### **ABSTRACT**

A study was conducted to investigate factors influencing high consumption of rice in Indonesia and to conduct intervention strategies for reducing the high consumption of rice. In the first phase, 821 Indonesian participants were asked to fill in a questionnaire about knowledge and beliefs about rice as staple food. Most participants are unaware about the importance of reducing rice consumption. There were also several wrong beliefs found about consuming non rice as staple food. In the second phase of the study, 119 students, 44 housewives and 17 office-workers were involved in a campaign program to educate the participants about relevant knowledge concerning rice consumption. Knowledge about food and the awareness of reducing rice consumption of participants were increased after the campaign. In the third phase, 5 families (17 participants) were involved in a food provision program. For 21 consecutive days they were provided with various non-rice menus for their breakfast. Result shows that there was no intention of the participants to change their food choice after the food provision was over. We conclude that behavior intervention that is effective in reducing rice consumption in Indonesia is in the form of campaign; consist of importance of reducing rice consumption, food security that is alarming in Indonesia, and advantage of consuming non rice as staple food.

**Key words:** rice consumption, intervention, campaign, food provision

### **INTRODUCTION**

As reported by FAO and the International Rice Research Institute (IRRI), Indonesia is recorded as a country that has high rice consumption per capita (*i.e.*, 139 kilograms per year in 2008; IRRI, 2008). The picture of Indonesian rice consumption has not changed for years, while other countries such as Malaysia and Japan have succeeded in reducing their rice consumption (*i.e.*, Malaysia has reduced its rice consumption to 80 kilograms per capita per year, and Japan consumes only 60 kilograms of rice per capita annually (IRRI, 2008). Ironically, as a rice producing country, Indonesia is also the biggest rice importer country in the world since 2009. If this condition continues, Indonesia will face a serious problem on food security. Food security is defined as “*a condition when all people at all times have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preference for an active and healthy life*” (World Food Summit, 1996).

High dependency on rice as a staple food has several negative effects (Hariyadi, 2009). First, it could be a constraint for the development of local food resources which gave implications on less research investment into non-rice-based foods. Second, obtaining food security with one or two food items can be viewed as a vulnerable point of national security. Third, other kinds of food need to be promoted as staple food because rice supplies are likely to be decreasing from time to time. The poor condition of food security in Indonesia is becoming worse as Indonesia suffers from high population. The Indonesia Statistical Bureau reported that Indonesia has already more than 250 million people (Indonesia Statistical Bureau, 2010). With a population of more than 250 million people and still depending on imports to fulfill its need for staple food (*i.e.*, rice), food security in Indonesia is alarming.

To solve food security problem, besides attempting to increase domestic rice production, the Indonesian government is trying to implement a program to socialize the idea of food diversification program. Food diversification means having the presence of a broader food variety. It could also mean the enhancement of food availability, accessibility and stability (FAO, 2008). Considering the importance of food diversification, effort for food diversification has been invested for years in many countries such as Japan (Uehara, 2012). As a matter of fact, Indonesia has a big opportunity to reach its national food security by implementing food diversification. Almost every region in Indonesia has their own potential traditional staple food; some are even easier to grow than rice, such as corn in the islands of Maluku and cassava in Papua. Therefore, it is obvious that there is a huge possibility to reorient the regional food development to obtain food diversification in Indonesia.

However, several researchers have identified the cause of food diversification program failure in Indonesia. Handewi and Ariani (2008) underlined the importance of more comprehensive human resource development in the fields of food and nutrition science/technology through education and training. Cahyani (2010) noted that food security program in Central Java has not been going well because it is hampered by a culture which regards rice as the one and only main staple food. To be able to change this culture, Cahyani said that changing the mindset of the people plays a very important role. Arifin (2009) also pointed out that the public's virtual addiction to rice is effectively a cultural barrier to food diversification. There is a common belief that rice has to be eaten every day, even if alternative foods such as bread, corn, cassava or potatoes are readily available. Eating rice is also seen as a status symbol, while cassava is generally associated with poverty. Based on these reasons mentioned above, it could be hypothesized that the root problem of unsuccessful food diversification programs in Indonesia might have something to do with cultural and psychological barriers.

Food has for a long time been assumed to have a role in society beyond just filling empty stomachs – it has several meanings for an individual such as a statement of the self (*i.e.*, food provides information about the individual's identity) and social interaction (*i.e.*, food is a social symbol of social worth (Wolf, 1990). Food is also viewed as a common tool to communicate with the family and as cultural identity (Todhunter, 1973). The meaning of food can be seen from the choice of food made by people. Several decades ago, Davis (1928, 1939) proposed that food choices are influenced by cognitive factors (include attitudes, social norms and perceived controls), psycho-physiological factors (include neurochemical senses, chemical senses, food availability and mood, and stress) and developmental factors (include food exposure, social learning, and associative learning). In addition, Pike and Ryan (2004) include awareness, knowledge, or beliefs about food in cognitive aspects. However, cognitive approach to food choice has been criticized for its focus on individual variables, rather than other social variables (Ogden, 2010). Among psycho-physiological factors, big attention is given to food availability (*i.e.*, the physical presence of food when it is needed) as something that could highly influence the food choice. In relation with developmental factors, food exposure in particular, Birch and Marlin (1982) stated that exposure for more than 8 or 10 times during 6 weeks period could change the preference significantly. Furthermore, Williams et al. (2008) also mentioned

that the impact of food exposure is accumulative. Related to developmental factor - social learning, Davis (1928) stated that social learning refers to the influence of observing other people’s behavior on one’s own behavior and also known as modeling or observational learning. It has to do with roles of peers, parents, and the media. Developmental factor - associative learning, refers to the impact of contingent factors on behavior such as food paired with rewards, food used as rewards, and food paired with the physiological consequences.

Food choice as well as eating behavior is evidently very difficult to alter because so many factors influence it. Buttriss et al. (2004) reviewed various methods to change food choice and eating behavior, and stated that intervention is one of the most common method used among any other methods. Intervention has four key issues to be addressed (Steg and Abrahamse, 2010), those are identification of the behavior to be changed, examination of the main factors underlying this behavior, application of interventions to change the relevant behavior and their determinant, and evaluation of intervention effects on the behavior itself. The choice of intervention strategies will be based on feasibility, cost-effectiveness, and availability of resources. Intervention could be in the form of persuasive communications, perhaps in the form of newspaper ads, flyers distributed in certain neighborhoods, or TV service messages. Other alternatives are face-to-face discussions, observational modeling, or any other applicable method.

This study sought to implement behavior intervention to reduce rice consumption in Indonesia. Then, the implemented behavior intervention is evaluated to choose the best intervention to be suggested to Indonesian government regarding rice consumption in Indonesia. The study was conducted in three consecutive phases. In the first phase, perception toward rice as staple food and the psychological barriers of reducing rice consumption among Indonesians were investigated using a questionnaire that was specially designed for the purpose of this research. The first phase of the study was started with hypotheses that there were wrong beliefs about rice as staple food that could be observed and intervened. The results of the first phase study were used as bases in designing and formulating an information campaign program for students, workers, and housewives (*i.e.*, the second phase of the study) and also as bases in implementing behavior intervention in the form of food provision (*i.e.*, the third phase of the study).

## MATERIALS AND METHODS

The three consecutive phases of the study can be summarized as can be seen in Table 1.

**Table 1.** Three phases of the present study

	Survey	Information Campaign	Behavior Intervention
<b>Participants composition</b>	266 housewives 267 office-workers 288 students	119 students 44 housewives 17 workers	17 family’ members (from 5 different household)
<b>Sampling method</b>	Random sampling	Purposive sampling	Purposive sampling
<b>Procedure</b>	Questionnaire, interview	Information campaign	Food provision

### Survey on perception of rice as staple food

The first phase of the study was aimed to investigate knowledge and belief toward rice and rice consumption as staple food. A survey was conducted to collect epidemiological data and information regarding the participants’ eating habits, their knowledge on rice and non-rice foods, and their belief and attitudes toward consumption of non-rice foods.

### *Participants*

Eight hundred and twenty one participants (mean age = 33.45, SD = 14.3, 574 female) –were participating voluntarily in this study. They were 266 housewives, 267 office-workers (144 female), and 288 students (166 female). Large number of participant is involved in this first phase to achieve representative data of baseline study. The reason for including students in this study, in particular student in junior high school and university students is because these students has already have power to make decision about type food they want to consume. For workers, we included this group as work place is an attractive setting for food choice interventions, as a wide target group can be reached and a supportive environment can be provided. Whereas reason for including family in particular for food provision was because food decision-making processes interact with family and community environments to shape families' thinking (*i.e.*, their constructed reality) about food, eating, health, and well-being as discussed by Gillespie and Gillespie (2007). Each category of participants was represented by three different social classes (*i.e.*, low, middle and high social classes, based on categorization of world bank as follows: low class spend less than US \$ 2 per day, middle class spend US \$ 2-20 per day, high class spend more than US \$ 20 per day; The World Bank, 2010).

### *Procedures and Materials*

A number of data collectors visited local communities of housewives, workplaces and schools from 3 different social classes in three regions of Java Island, with Kediri and Lamongan as representatives of East Java, Yogyakarta as a representative of Central Java, and Bandung and Garut as representatives of West Java. Java is selected as location of study due to the fact that most Indonesians live in Java and staple food in Java is rice. The sampling method used was purposive sampling and the participants were asked to sign an inform consent prior to the study begins. Following this, a set of questionnaires were given to be filled-in by the participants. For some low social class participants, the data collectors read the questions and wrote down the participants' answers (*i.e.*, it was more or less like a semi-structured interview).

The questionnaires were carefully designed by the researchers, especially to be able to capture the existing condition of the participants' demographic characteristics, eating habits, food choices during meal time, knowledge about the varieties of Indonesian staple foods and belief toward consumption of non-rice meal. A construct validity testing was performed to validate the questionnaires. A number of experts in the field of psychology were asked to discuss the questionnaire until reaching an agreement that the items used in the questionnaires could really measure the construct being studied.

### **Information Campaign**

Based on the results of the study in the first phase, an intervention program in the form of a campaign was developed to change the knowledge and belief towards rice and the consumption of rice among students, housewives, and office-workers. The campaign also intended to promote the consumption of non-rice food as an alternative staple food.

### *Participants*

A total of 180 participants were participated in the second phase. They were 119 students (mean age = 15.9, SD = 2.9, 48 female), 44 housewives (mean age = 51.6, SD = 7.3) and 17 workers (mean age = 39.2, SD = 10.6, 6 female). Number of participants in the second phase is limited compared to the first phase due to technical reason. The "pretest-posttest within subject" experimental design was used to measure the difference between the participants' knowledge and belief towards the

consumption of non-rice food before and after the campaign. Purposive sampling was implemented in selecting the participants.

#### *Procedure and Materials*

The participants were gathered in a room. First, they were asked to fill out a pre-test questionnaire. The pre-test questionnaire measured the participants' knowledge and belief about rice consumption. Next, a presenter stood up in front of the room and presented a short lecture (about 30 minutes) using a set of power-point slides entitled "Reducing rice consumption". The short lecture contained about: fact about rice (*i.e.*, nutritional facts of rice, glycemic index of rice, diseases and several negative impact of rice over-consumption such as diabetes and obesity), Indonesian food security that is alarming, alternative staple foods available in Indonesia (e.g., potato, cassava, and corn) and incorrect beliefs about eating non-rice food (*i.e.*, feeling hungry, dizzy, weak, and have not eat yet if not consuming rice). In addition, the short lecture also encourages people to reduce frequency of rice consumption from three to two times a day, as well as reducing portion of rice in each meal. The content of the campaign was cautiously prepared and tested in various ways regarding its clarity, and delivered attractively with nice sense of humor by a psychologist who has his own experience in reducing rice consumption,

The participants were allowed to ask questions during and after the campaign presentation. This short lecture and question-answer session were meant to as an intervention to promote the participants knowledge and belief toward non-rice consumption. After the short lecture and question-answer session is over, the participants were asked to fill-in a post-test questionnaire, similar to the one they have filled-in before the presentation. At the end of the campaign program, participants were asked whether they have intention to eat rice twice a day for the next three months. This question is intended to measure changes of intention after intervention. In the question, "the next three months" is included to give time horizon to participant to avoid ambiguity of participants about duration of intention.

#### **Behavior Intervention**

Since food availability was hypothesized to play an important factor in food choice, food provision would be the third phase of the study. In this phase, the participants were provided with non-rice meals for their breakfast in 21 consecutive days.

#### *Participants*

Five families (17 participants in total) participated in this study, consisted of seven adult male (mean age = 31.43 year, SD = 15.63), five adult female (mean age = 49.80 year, SD = 7.16), and five teenage female (mean age = 18.2 year, SD = 8.7). Number of participants in the third phase is limited due to technical reason. The "pretest-posttest within subject" experimental design was used to measure the difference between the participants' knowledge and belief attitude towards non-rice consumption before and after food provision, as well as intention to consume non-rice as staple food. Purposive sampling was implemented in selecting participants.

#### *Procedure and Materials*

Before the food provision session begins, the participants were gathered in a room and an inform consent was signed. In the beginning of this phase, for a period of six days, they were asked to write down their daily food choice in a diary (provided by the researcher) and to rate (on a five-point scale) their feelings (*i.e.*, feel full, feel hungry, feel dizzy, and feel as if they have not eaten yet) toward the food they chose to eat. Starting from the seventh day, for 21 consecutive days, the

participants were provided with one non-rice meal menu for breakfast. The non-rice food menus provided for the participants are as follows: macaroni soup + vegetables + milk for first day, sandwich + chicken fillet for second day, fried noodle + meat balls + egg + vegetables for third day, baked potato + cheese for fourth day, baked of mixed cassava, corn, cheese, and carrot for fifth day, fried potato + egg for sixth day, misoa for seventh day. The menus were repeated every 7 days. They were asked to consume the provided meal at their breakfast and were also asked to write down how they felt about the specific meal provided. The non-rice meal provided for the participants at their breakfast time was chosen based on their preferences (as found out in the first phase of the study). They were allowed to consume any meals they like (either rice or non-rice meal) for lunch and dinner. They were also asked to write down their choice of food and their feeling toward the chosen food in each lunch and dinner. In the end, after 21 days of food provision, the participants were asked again to write down their intention to consume non-rice as staple food, their food choice, for breakfast, lunch and dinner; and complete the diary with a note about how their feelings are toward those chosen food.

### **Statistical analysis**

The data obtained in this study were analyzed by using SPSS (version 16.00). Data in the first phase were statistically analyzed by using descriptive analyses. Paired t-test was used to analyze differences between before and after campaign. Behavior intervention data was analyzed using non-parametric test Kruskal-Wallis.

## **RESULTS AND DISCUSSION**

### **Survey of perception of rice as staple food**

Knowledge and belief toward rice and rice consumption as staple food for students, workers, and housewives can be seen in Table 2.

**Table 2.** Knowledge and belief toward rice and rice consumption as staple food for students, workers, and housewives

	<b>Student</b>	<b>Housewives</b>	<b>Workers</b>
<b>Frequency of eating rice 3 times a day</b>	60%	56.8%	58.8%
<b>Opinion about rice consumption level in Indonesia</b>	very high (30%) high (11%) average (59%)	very high (54.6%) high (34.1%) average (11.3%)	very high (64.7%) high (17.6%) average (17.7%)
<b>Awareness to decrease rice consumption</b>	51.9% is unaware	45.5% is unaware	58.8% is unaware
<b>Wrong beliefs about non-rice as a staple food</b>	69 % feel still hungry 27% feel dizzy 61% feel they have not eaten if they did not eat rice.	60% feel still hungry 27% feel dizzy 59% feel they have not eaten if they did not eat rice.	51 % feel still hungry 25% feel dizzy 63% feel they have not eaten if they did not eat rice.

The main findings of the survey showed that students, housewives, and workers gave similar pictures. In general, they rely on rice as staple food. They consume rice for breakfast, lunch, and dinner. The main reason for choosing rice for the main menu is habit. Most participants have knowledge that rice consumption in Indonesia is on high or very high level, however, their awareness that rice consumption must be reduced is lacking.

Results of the first study shows that problem in reducing rice consumption in Indonesia is related to the awareness that rice consumption must be reduced and wrong beliefs about consuming non-rice as staple food. Therefore, attempts to increase the awareness to reduce rice consumption are playing an important role in reducing rice consumption in Indonesia.

**Information Campaign**

Differences between before and after campaign for each category (students, housewives, workers) can be seen in Table 3.

**Table 3.** Differences between before and after campaign for each category (students, housewives, workers)

	<b>Students</b>	<b>Housewives</b>	<b>Workers</b>
<b>Food knowledge</b>	$t(118) = -11.99,$ $p < .001^*$	$t(42) = -3.67,$ $p = .001^*$	$t(16) = -0.48,$ $p > .01$
<b>Awareness to reduce rice Consumption</b>	$t(118) = 6.30,$ $p < .001^*$	$t(42) = 1.15,$ $p > .01$	$t(16) = 0.12,$ $p > .01$

\*significant with  $\alpha=0.05$  based on paired t-test

Table 3 shows that for each group (*i.e.*, students, workers, and housewives), food knowledge was better after campaign. However, the increased awareness to reduce rice consumption was only found in student participants. The absence of increased awareness in workers could be influenced by the food pattern they possess. Workers eat only twice a day, because they skip lunch time in work hour (as lunch had to be paid by themselves) in order to save their money. As they have already eat rice twice a day, it is likely that the awareness to reduce rice consumption is absent. They have already aware to reduce rice consumption for different reason. The absence of increased awareness in housewives could be related to uncontrollable factors during campaign and the process of filling-in the questionnaire. Some of them had difficulties in reading and filling-in out the questionnaire. They were not prepared to do reading, writing, and did not bring their eyeglasses. This made them unable to answer the questionnaire properly and completely.

**Behavior Intervention**

Non-parametric test Kruskal-Wallis was applied in analyzing participants' feelings (*i.e.*, feel hungry, feel dizzy, feel as if have not eaten yet) after every breakfast, lunch, and dinner. As already been noted earlier, only at breakfast time participants were provided non-rice food. Result shows that among 17 participants of food provision, the only feeling that differs statistically significant among breakfast, lunch and dinner time was feel hungry ( $p < 0.001$ ). Whereas feel dizzy and feel as if have not eaten yet does not differ statistically significant among the three meal times. Nonparametric Mann-Whitney test was conducted to analyze the difference between food choice before and after food provision. There was no significant difference on food choice before and after intervention.

The feeling of have not eaten yet and dizziness (that are common incorrect beliefs about eating non-rice food) was not shown for both rice eaters and non-rice eaters during food provision. This indicates wrong beliefs in Indonesians that eating non-rice staple makes them dizzy, give a feeling of have not eaten yet, and make someone weak. However the feeling of hunger was significantly different between rice consumption and non-rice consumption, in which most people feel hungrier when consume non rice than consume rice.

*General discussion*

In general, regarding intervention that is implemented in this present study, the importance of campaign to increase knowledge and awareness of Indonesian about reducing rice consumption are also realized by the Indonesian government. The Indonesian Minister of Agriculture, who supports such moves, was quoted as saying: "There's a saying in Indonesia that if you haven't eaten rice during the day, you haven't eaten at all. So we need to educate our population". Related with educating people in particular campaign in Indonesia, Taylor (2012) stated that material of campaign of reducing rice consumption is usually difficult to be understood. In the present study, campaign in the present study was prepared with cautions, tested in various ways regarding the clarity, and delivered attractively by a psychologist who has his own experience on reducing rice consumption, equipped with a nice sense of humor. The campaign material and ways of delivering the material plays an important role for a successful campaign.

Related to food provision, there was no significant difference on food pattern before and after food provision. This result indicates that food provision did not influence willingness to consume non rice as a staple food. This result could be explained based on duration of food provision. Lally *et al.* (2010) in their series of experiment found that the average time to create a habit was 66 days, but the range was from 18 to 254 days. They argued that only one literature related with this issue was found, that was Ronis *et al.* (1988), who argued that a behavior is habitual once it has been 'performed frequently (at least twice a month) and extensively (at least 10 times)' (p. 213). Lally *et al.* continued to argue that it is likely to take much longer than this for a repeated behavior to reach its maximum level of automaticity. Since the duration of food provision in this study is 21 consecutive days, it seems that duration plays an important role in this study. However, it should be underlined that 21 days is still in the range mentioned by Lally *et al.*. Other studies also used short range for food intervention, such as 25 days (Normand and Osborne, 2010), result in significant differences between before and after intervention.

Related with food availability and food preferences, as seen from the food provision that has not succeed in changing intention, availability of non-rice food was the only factor that influences willingness to consume in housewives. It could be understood as it is very common in Indonesia that housewives are the ones responsible for providing food to their family.

Based on literature study and questions has been asked in questionnaire of this study, other factors than availability of non-rice food that influence reducing rice consumption in Indonesia are culture and socio economic status. Although at the first time we hypothesized reducing rice consumption in Indonesia is hampered by culture (collective wrong belief that rice has to be eaten every day and rice is a symbol of status), this wrong belief can be minimized via campaign of reducing rice consumption. This fact can be found in all type of economic status (low, middle, and high income class).

Although such programs have been tried for decades in Indonesia, rice consumption continues to rise with the growing population and attempts to get people to cut back on it have never worked before. With regards to Indonesian government effort to reduce rice consumption in Indonesia, it should be underlined that the most important factor that influences rice consumption is awareness that rice consumption must be reduced due to food security and healthy reason. One day no rice (ODNR) campaigns might not be effective as it seems too difficult for Indonesians to spend one day without rice. This fact is supported by the Indonesian government whose admits that ODNR was not successful in reducing rice consumption in Indonesia (Hidayat, 2012). Based on the result of present study coupled with failure of Indonesian government in reducing rice consumption in Indonesia, it is likely that the most effective way in reducing rice consumption in Indonesia is by



reducing the frequency of rice consumption a day (e.g., from three times to be twice a day) or reducing the portion of rice each time the Indonesians eat.

This study is the first study on behavior intervention for changing food preference or reducing rice consumption in a large society to address food security issues in Indonesia. Results of this study could be proposed to be as a model for other countries that also have the problem on reducing rice consumption and intend to obtain food security through reduction of rice consumption. Knowledge management related to reducing rice consumption in Indonesia will be studied further in order to maintain the results of this present study.

It is expected that the results of this study could be implemented in a broader area in Indonesia, and finally, the love affair between Indonesian people and rice could be broken up, and the ultimate objective related to food security could be reached. Moreover, Indonesian people (especially in rural areas) are expected to be able to increase their income and poverty will be reduced.

This study has several limitations. First, the study is restricted to Java Island, whereas other main islands in Indonesia were not covered. However, as Java has the highest population density in Indonesia and major ethnic groups live in Java, we could assume that the results of the same study conducted in another island than Java might reveal almost similar results. Second, the group involved in this study was restricted to students, workers, and housewives. Considering other groups than the three groups would be valuable for drawing further conclusions.

### **CONCLUSION**

This study shows that behavior intervention is effective in reducing rice consumption in Indonesia in the form of information campaign; consist of importance of reducing rice consumption, food security that is alarming in Indonesia, and advantage of consuming non rice as staple food. Food provision gives no significant result compared with information campaign in reducing rice consumption.

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