Effects of Moringa Oleifera and Royal Jelly Supplementation on Nutritional Status and Cognitive Function in Adolescent Girls in Takalar District, South Sulawesi, Indonesia: Protocol Study

ABSTRACT

Background: Failure to achieve optimal nutritional status in adolescent girls negatively impacts quality of future human resources. National program of Iron-Folic Acid (IFA) tablet supplementation has not shown optimal results due to low compliance and side effects. As an alternative, a food-based supplementation using locally sourced*Moringa oleifera*enriched with royal jelly (MRJ) has been developed. The MRJ formulation is rich in nutrients and has the potential to improve nutritional status and cognitive function. This study evaluates the effect of MRJ on nutritional status and supplement cognitive function in adolescent girls.

Methods: This double-blind, randomized controlled trial was conducted among 372 adolescent girls aged 10–19 years from junior and senior high schools in Galesong Selatan, Takalar District, South Sulawesi. Participants were randomly assigned to either the intervention group receiving MRJ capsules (each containing 490 mg*Moringa oleifera*extract and 10 mg*royal jelly*, taken twice per week for 12 months), or the control group receiving weekly IFA tablets (60 mg elemental iron and 400 µg folic acid) following national guidelines. Both groups received standardized nutrition education via TikTok videos. Data collected at baseline, 6 months, and 12 months included anthropometric indicators (BMI-for-age, height-for-age, MUAC), hemoglobin levels (measured using Hemocue), dietary intake (24-hour recall and FFQ), and cognitive function (assessed using the Culture Fair Intelligence Test/CFIT). Adherence was monitored through weekly control sheets verified by teachers, and digital documentation via WhatsApp.

Discussion: The study was designed to assess whether MRJ offers a superior, culturally acceptable supplementation strategy compared to IFA. Results will inform local policy and broader applications of food-based interventions to improve adolescent nutrition and cognitive development.

Keywords

Anemia, Moringa oleifera, Royal jelly, Nutritional status, Cognitive function.

INTRODUCTION

Background and rationale

Adolescence is a crucial time characterized by substantial cognitive and psychological development as well as rapid physical growth (1). For these processes to be supported, optimal nutrition is crucial during this phase (2). Long-term health effects of nutritional deficiencies include stunted growth, anemia, and impaired cognitive function, especially in adolescent girls (3.4). Adolescents around the world, particularly girls, face starting nutritional challenges (5). The World Health Organization notes that iron deficiency is the primary cause of anemia in about 30% of teenage girls, a statistic that emphasizes the necessity of focused interventions (6). Adolescent girls in Indonesia continue to suffer from a startingly high rate of chronic energy deficiency (CED); national surveys show that more than 21% of them consume insufficient amounts of energy, which results in less-than-ideal growth and development (7.8).

Long-term nutritional deprivation can result in stunting, which is still a serious problem (9). According to recent studies conducted in Indonesia, among teenage girls between the ages of 16 and 18, the prevalence of stunting can reach 26.9% (10). In addition to limiting physical potential, stunted growth has significant effects on cognitive development, academic achievement, and future economic productivity (11,12). A second chance to lessen the long-term effects of stunting is to address it during adolescence (13). These difficulties are aggravated by anemia, which is primarily brought on by iron deficiency (14). Although the prevalence of anemia among teenage girls in Indonesia declined marginally from 32% in 2018 to 24.1% in 2023, it is still a public health issue (15). Anemia impairs physical activity, cognitive function, and general quality of life by affecting the blood's ability to carry oxygen (16,17). Pregnant girls who have anemia are more likely to experience problems for both the mother and the unborn child (18).

Implementing traditional supplementation programs, such as giving out iron-folic acid tablets, has proven difficult (19). One major obstacle has been low compliance brought on by side effects like gastrointestinal distress (20). Program success is further hampered by poor awareness of the significance of supplementation and restricted access to healthcare facilities (21,22). There is an urgent need for alternative strategies that are both successful and acceptable in the culture (23). A plant that is indigenous to tropical and subtropical areas, Moringa oleifera, has gained attention as a possible remedy (24). Often referred to as "the miracle tree," Moringa is high in antioxidants, vitamins, and iron (25). Research has indicated that it is effective in lowering oxidative stress and

raising hemoglobin levels, both of which improve cognitive function (26,27). The supplement is even more effective when mixed with royal jelly, a nutrient-dense secretion made by honeybees (28). Vitamins B5 and B6 as well as proteins and essential fatty acids, which are found in royal jelly, are known to improve energy metabolism and cognitive function (29).

Adolescent nutrition programs can take a new approach by incorporating Moringa Oleifera Enriched Royal Jelly (MRJ) (30). Because of its natural origins and ease of consumption, MRJ is less likely to cause side effects than traditional supplements and may be more acceptable to teenagers (27). Furthermore, it has been demonstrated that MRJ promotes neurocognitive development by offering vital nutrients needed for brain function and neurotransmitter synthesis (26,29). Adolescent girls' nutritional needs must be met for both their immediate health and the benefit of society as a whole (3.12). Their nutritional status as expectant mothers has a direct effect on the development and health of the offspring (18,22). Improving adolescent girls' nutritional status helps end the intergenerational cycle of malnutrition, which boosts economic growth and human capital (13,30). The purpose of this study is to assess how MRJ supplementation affects the nutritional status and cognitive function of teenage girls in Galesong Selatan, Takalar Regency.

Objectives

The general objective of this study is to assess the effectiveness of Moringa Oleifera Enriched Royal Jelly (MRJ) supplementation in improving the nutritional status, hemoglobin (Hb) levels, and cognitive function of adolescent girls in Takalar District, South Sulawesi, Indonesia. The study aims to evaluate whether MRJ supplementation, when administered over a 12-month period, can lead to significant improvements in these critical health and cognitive outcomes.

Study Design

This study employs a true experimental design with a randomized controlled double-blind pretest-posttest approach. Baseline data collection was conducted in the first year, followed by a 12-month intervention during the second and third years. Participants were randomly assigned to two groups: the intervention group received Moringa Oleifera enriched Royal Jelly (MRJ) capsules (containing 500 mg of moringa leaf extract and 10 mg of royal jelly, 2 capsules per week), while the control group received iron-folic acid (IFA) tablets at a dose of 500 mg per week. Both groups received standardized nutrition education through TikTok videos. The intervention was conducted

in a double-blind manner using coded packaging. Nutritional status was evaluated at month 6, and comprehensive assessments of nutritional status and cognitive function were conducted before and after the 12-month intervention.

METHODS: PARTICIPATION, INTERVENTIONS, AND OUTCOMES

Study setting

The study was conducted in Galesong Selatan, Takalar Regency, from July to November 2024, involving two schools: SMAN 13 Takalar and SMPN 3 Galesong Selatan. These schools were chosen due to their representativeness of the adolescent population in both urban and semi-urban settings. Ethical considerations ensured confidentiality regarding specific school identification.

Eligibility Criteria

Sampling in this study was conducted using purposive sampling technique. After determining the study location, nurses were selected purposively. To be eligible for the study, participants must meet the following criteria:

(1) Age 10–19 years

(2) Adolescent girls' who are active in grades 1 and 2 (junior high and senior high)

(3) Severe nutritional or health conditions (eg, severe anemia, severe malnutrition, allergies), determined through clinical history and validated self-reports.

Who will take informed consent?

The researcher and/or enumerator will obtain informed consent from adolescent girls who fit the criteria. Each student's willingness is included in their informed consent, which has been approved by their parents and teachers (class advisors). Following clear explanations of the purpose of the study and the procedure, both the participants and their guardians are given.

Additional consent provisions for collection and use of participant data and biological specimens

The study was conducted with the knowledge and permission of relevant authorities, including the Takalar District Education Office for junior high schools, the Provincial Education Office for senior high schools, and Bontokassi Primary Health Center, as the selected schools falling under its jurisdiction. Approval was also obtained from each participating school. Participants' data and biological specimens were anonymized and securely stored. Additional explicit consent was provided

obtained for the use of biological specimens in further analyses, ensuring transparency and compliance with ethical standards.

Interventions

Explanation for choice of comparators

Indonesia's national program on nutritional supplementation includes the “Aksi Bergizi” initiative, which provides iron supplementation through the distribution of Iron-Folic Acid (IFA) tablets to adolescent girls. This intervention aims to increase hemoglobin levels and prevent anemia. IFA tablets are distributed regularly under the supervision of school health personnel to ensure compliance (97). Adolescent girls are required to report their intake, and health staff provide counseling in case of problems or complaints. In addition to distribution, the program offers education on the importance of iron supplementation. Adolescents receive explanations on how the IFA tablets work, their benefits, and ways to manage possible side effects (98).

The Iron-Folic Acid Supplementation Program for adolescent girls is a crucial effort to prevent and address anemia. Anemia among adolescent girls remains a serious public health concern, especially in developing countries like Indonesia. This condition can lead to adverse outcomes such as reduced concentration, lower academic performance, and other health issues. Therefore, IFA supplementation serves as a vital preventive strategy (99).

The supplementation involves providing tablets containing iron and folic acid to adolescent girls on a regular basis. The dosage depends on whether the purpose is prevention or treatment. For prevention, which targets adolescent girls without anemia, the tablets typically contain 60 mg of elemental iron and 400 mcg of folic acid, taken once weekly for one year. This dosage is designed to meet daily nutritional needs and prevent iron deficiency during periods of rapid growth (100). For treatment, adolescent girls diagnosed with anemia receive a higher dose—generally 60 mg of elemental iron and 400 mcg of folic acid taken daily for three months, or as advised by healthcare providers. The therapeutic goal is to rapidly raise hemoglobin levels and address existing anemia (101).

The distribution process begins at the local health office, where IFA tablets are delivered to schools through community health centers or other healthcare facilities. Upon arrival at the school, health personnel are responsible for distributing the tablets to registered adolescent girls. An orientation program is provided to students and parents at the beginning, explaining the importance of IFA

supplementation, proper intake methods, and the associated health benefits. This is intended to ensure that all stakeholders understand the program's purposes and procedures (102).

Although the program has demonstrated effectiveness in several studies when implemented according to guidelines, challenges remain in practice. Unequal distribution of IFA tablets has resulted in limited access for some adolescent girls. Low compliance, driven by limited knowledge, aversion to the tablets, and side effects, have also significantly hindered the success of the program.

Intervention description

The study will involve two groups:

1. **Control Group**: Participants will follow the *Nutritious Action* program, which includes Iron-Folic Acid (IFA) supplementation and video-based education using the TikTok application.
2. **Intervention Group**: Participants will follow the *Nutritious Action* program, but IFA supplementation will be substituted with MRJ (Moringa-Royal Jelly). They will also receive video-based education via TikTok, using the same content as the control group.

The IFA tablet contains 60 mg of elemental iron and 400 µg of folic acid. Meanwhile, MRJ (500 mg) consists of 490 mg Moringa extract and 10 mg Royal Jelly extract, and contains various nutrients such as iron (9.72 mg), vitamin C (46.2 mg), zinc, calcium, flavonoids, polyphenols, antioxidants, beta-carotene, and other essential vitamins and minerals.

Criteria for discontinuing or modifying allocated interventions

Adolescent girls enrolled in the clinical trial who experience allergic reactions or adverse effects reported in either study group will be referred to a midwife or physician for evaluation and guidance on whether to continue participation or withdraw from the study. Participants are free to withdraw at any time and for any reason without any consequences.

Strategies to control interventions

Schools and students for both the intervention group (MRJ) and the control group (IFA) will be selected to participate in the study. One teacher from each school—preferably the School Health

Unit (SHU) teacher—will be invited to assist and supervise students consuming the supplements at school on a designated day each week.

Each student will receive two capsules per week—one to be consumed at school under supervision, and one to be taken home as a backup in case the student is absent on the scheduled supplement day the following week.

Each participant will be provided with a monitoring sheet, which will be signed by the supervising teacher if the supplement is consumed at school. If consumed at home, the student is required to submit photographic documentation with a real-time timestamp. This documentation will be reviewed by the supervising teacher and acknowledged with a signature on the student's compliance sheet.

If a student is absent on the scheduled day, he may take the supplement at home with appropriate documentation, which will be verified by the teacher for validation and recorded on the control sheet.

A WhatsApp (WA) group will be created for each study group. Through these groups, the researcher will send regular reminders to students to take their capsules on the designated day. In addition, educational links related to anemia in adolescent girls—including its impacts, prevention, and the benefits of the given supplements—will be shared monthly. A total of 12 different educational videos will be sent throughout the study period.

Biweekly school visits will be conducted to evaluate implementation, confirm supplement consumption, and identify any barriers or difficulties encountered by students in taking the capsules.

Operational Definition

a) Moringa Extract Enriched Royal Jelly (MRJ) Administration

The intervention group will receive a capsule formulation (500 mg) containing 490 mg of *Moringa oleifera*extract and 10 mg of royal jelly extract. Each capsule contains essential nutrients such as iron (9.72 mg), vitamin C (46.2 mg), zinc, calcium, flavonoids, polyphenols, antioxidants, beta-carotene, and other vitamins and minerals. The capsules will be administered to anemic adolescent girls at a dosage of two capsules per week over a 12-month period.

b) Iron and Folic Acid (IFA) Administration

IFA tablets (containing 60 mg of elemental iron and 400 µg of folic acid) will be distributed to adolescent girls according to the national program. Both MRJ and IFA will be administered under a double-blind design, ensuring that both supplements appear visually identical in capsule form.

c) Compliance Monitoring

To assess adherence, a consumption control sheet will be provided to each participant by the researcher or enumerator. This sheet will be checked and signed by the assigned supervising teacher. If capsules are consumed at school, the teacher will sign the sheet. If taken at home, the participant must document the intake with a time-stamped photo, which the teacher will verify and sign accordingly.

d) Nutrient Intake

Nutrient intake refers to the total consumption of macronutrients (energy, carbohydrates, fats, and proteins) by adolescent girls in a day. This will be measured using a 24-hour dietary recall and a Food Frequency Questionnaire (FFQ), and compared with the recommended dietary allowance (RDA) for their age.

e) Nutritional Status

Includes Body Mass Index-for-Age (BMI/A), Height-for-Age (H/A), Mid-Upper Arm Circumference (MUAC), and hemoglobin levels:

- Body weight will be measured using a SECA digital scale.
- Height will be measured with a stadiometer.
- MUAC will be assessed using a standard MUAC tape.
- Hemoglobin levels (Hb) will be measured using a Hemocue device by trained enumerators.

f) Cognitive Function

Cognitive function will be assessed using the standardized *Culture Fair Intelligence Test* (CFIT) questionnaire. The test will be administered and analyzed directly by a licensed psychologist from Hasanuddin University.

Study Subjects

The population in this study includes all female students at junior high schools (SMP) and senior high schools (SMA) in Galesong Selatan Subdistrict, Takalar Regency, South Sulawesi

Province. The sample size in this study is calculated using the formula for estimating the mean difference between two paired groups, as proposed by Lemeshow and Wanga (1991), as follows:

$$n = \frac{\sigma^2 (z_{1-\alpha/2} + z_{1-\beta})^2}{(\mu_o - \mu_a)^2}$$

$$=2 \times \frac{1.23^2(1.9+0.9)^2}{(11.42-10.85)^2}$$

$$=\frac{3.02(7.84)}{(0.57)^2}$$

$$=\frac{23.7}{0.33}$$

$$=71.8 = 72$$

Note:

n : Sample Size

ó : Standard deviation 1.23

Z1-α: Significance level 95%(1.96) Z1-

β: Power of the test 90%(0.9) μ1

: Mean hemoglobin level in the MRJ intervention group (11.42 g/dl) :

μ 2 Mean hemoglobin level in the placebo intervention group (10.85 g/dL)

The sample size calculation was based on the standard deviation and mean values from previous studies for the dependent variable. Based on this calculation, the required number of participants was 72. However, to anticipate potential dropouts (DO), a 10% increase (7 participants) was added, resulting in a total of 79 participants. Therefore, each group will consist of 79 samples: 79 participants in the intervention group and 79 in the control group.

This study will collect two types of data: primary and secondary data. Primary data will be obtained through questionnaires distributed to the respondents and analyzed using SPSS version 26. Secondary data will be collected from relevant literature or previous research studies. The study will be conducted in three phases:

1) Preparation and Baseline Data Collection

This stage involves assigning students to the intervention and control groups. Baseline data collection will be conducted at the selected schools for each group, including

measurements of nutritional status (body weight, height, dietary intake, and hemoglobin levels) and cognitive function levels.

2) Intervention Phase and Mid-Evaluation

This phase involves interventions for the two groups: the intervention group receiving MRJ and the control group receiving IFA (iron and folic acid tablets). The MRJ and IFA capsules will be provided in pre-packaged bottles containing 10 capsules, to be consumed over 5 weeks. New supplies will be distributed every 5 weeks up to the 48th week (12 months).

3) Extended Intervention and Final Evaluation Phase

After 12 months, the nutritional and cognitive status of the adolescent girls will be reevaluated. This will allow assessment of improvements at 6-month intervals and determination of the most effective supplementation duration.

Instruments and Intervention Materials

Materials used in this study were MRJ and IFA capsules purchased as finished products. IFA contains 200 mg ferrous sulfate (equal to 60 mg elemental iron) and 0.25 mg folic acid. MRJ contains 500 mg moringa and 10 mg royal jelly. Both were packed in identical capsules in terms of shape, color, and size to ensure blinding, so no visual difference between them. Capsules were supplied by trusted manufacturer and randomly coded by independent third party to maintain confidentiality during intervention. Before distribution, materials were tested for quality to ensure safety and formulation consistency.

Instruments used included Kobo questionnaire, 24-hour recall and FFQ, anthropometric tools: digital scale (Seca) for weight, stadiometer for height, MUAC tape, Hemocue for hemoglobin levels, CFIT for cognitive test, and checklist sheets for monitoring MRJ and IFA capsule consumption compliance.

Nutrition and Anemia Education

Balanced nutrition and anemia education will be conducted both offline and online. Offline education will be given before and after the intervention (pre-posttest) through a 30– 45-minute lecture. Each session will include ice-breaking and a quiz with prizes to make the learning process interactive and enjoyable. Online education will run throughout the 12-month intervention via TikTok-based educational video links. These links will be shared with

study subjects through a WhatsApp group. Video updates will be sent every two weeks. The education topics, both offline and online, will remain the same, including:

Topic 1: Balanced Nutrition

Optimal nutrient intake is essential for the body's growth and development. Dietary patterns should focus on consuming a balanced diet—daily meals that contain nutrients in types and amounts that meet the body's needs.

Four Pillars of Balanced Nutrition:

1. Consume a variety of foods.
2. Practicing clean and hygienic living.
3. Engaging in physical activity.
4. Monitor body weight regularly.

Topic 2: My Plate Contents

A guide to food diversity and recommended portion sizes for each meal. Each plate should consist of 2/3 staple foods and vegetables, and 1/3 side dishes and fruits. It's also important to limit sugar, salt, and fat intake and drink adequate water.

Topic 3: Protein: The Body Builder

Protein is necessary for the formation of new cells, cell maintenance, and boosting immunity. Protein sources include animal proteins such as meat, fish, and eggs, as well as plant-based proteins such as tofu, tempeh, and legumes. A balanced intake of both animal and plant proteins is recommended.

Topic 4: Healthy Breakfast

Breakfast fulfills 20–25% of daily calorie needs. A healthy breakfast includes sources of carbohydrates, proteins, fats, and vitamins/minerals in appropriate portions.

Topic 5: Physical Activity

Regular physical activity helps maintain fitness, boosts metabolism, and prevents obesity. The WHO recommends 60 minutes of daily physical activity for children and adolescents.

Topic 6: Food and Beverage Labels

Food labels help consumers understand nutritional content, monitor sugar, salt, and fat limits, and ensure food safety. Nutrition literacy is crucial for making informed dietary choices.

Topic 7: School Canteens and Healthy Snacks

Avoid snacks with artificial coloring, reused cooking oil, and excessive sugar, salt, or fat content. Choose snacks from clean and safe vendors.

Topic 8: Fruit and Vegetable Consumption

Fruits and vegetables are rich in vitamins, minerals, and fiber. It is recommended to consume 3–4 servings of vegetables and 2–3 servings of fruit daily to maintain health and prevent disease.

Topic 9: Anemia and Iron

Anemia is often caused by iron deficiency. Prevention can be done by consuming iron-rich foods such as red meat, spinach, and legumes.

Topic 10: Micronutrients

Vitamins and minerals are essential for bodily functions, even in small amounts. Consume foods rich in micronutrients such as leafy greens, fruits, and legumes.

Topic 11: Sugar, Salt, and Fat

Limit intake of sugar (maximum 50 grams/day), salt (5 grams/day), and fat (67 grams/day). Excessive consumption increases the risk of chronic diseases.

Topic 12: Personal Hygiene

Clean living includes habits such as handwashing, food hygiene, and personal health maintenance. Good hygiene reduces the risk of infection and supports overall health.

Data Analysis

The primary data collected were then processed through several stages of data handling as follows:

a. Editing: The results obtained from interviews or questionnaires were first edited. If there were any incomplete data or missing information, corrections were made efficiently. If it was not possible to re-interview the respondent, the questionnaire was excluded from the dataset.

b. Coding: Each item in the questionnaire was assigned a numeric code to facilitate data processing and analysis.

c. Tabulation: The data were grouped and presented in tabular form in accordance with the research objectives, making it easier to analyze.

d. Processing: In this stage, the responses from participants, which had been translated into numerical form, were processed for analysis.

e. Cleaning: The data entered into the master table were rechecked, including verification of data entries and codes, to minimize errors during the data input process. If incorrect coding was found, it was corrected or removed based on the original questionnaire.

After the data processing phase, data analysis was conducted using SPSS, employing univariate, bivariate, and multivariate analyses.

- Univariate analysis aims to obtain an overview and describe the characteristics of each research variable, including age, education, income, occupation, parity, pregnancy history, dietary intake, mid-upper arm circumference, gestational age, infant length, and birth weight. This analysis generated frequency distribution tables and percentages for each variable.
- Bivariate analysis was conducted to assess the differences in means before and after the intervention within each group. A paired t-test was used if the data were normally distributed, while the Wilcoxon test was used for non-normally distributed data. For categorical data, the McNemar test was applied. To compare the mean changes between the three groups, One Way ANOVA was used for normally distributed data, and the Kruskal-Wallis test for non-normally distributed data.

- Multivariate analysis was performed to examine the effect of independent variables on the dependent variable using Logistic Regression analysis.

Quality Control

Quality control is directed toward minimizing errors that may arise from sampling factors (sampling error) or alpha errors, which include errors due to an inadequate sample size or an unrepresentative sample that does not accurately reflect the population. In addition, quality control also aims to address systematic errors or beta errors, which may originate from the measuring instruments, the measurer, or the object being measured.

Standardization of the instruments used was conducted through validity testing on adolescent girls. Prior to the implementation of the research, the researcher submitted formal requests and obtained approval from the relevant authorities, including the local health office,

schools, and community health centers (Puskesmas). Once permission was granted, an informed consent form was provided and signed by each respondent as a confirmation of their voluntary participation.

Research Ethics

This study was conducted after obtaining ethical clearance from the Health Research Ethics Committee of the Faculty of Public Health, Hasanuddin University, with Ethical Approval Number 2739/UN4.14.1/TP.01.02/2024, dated September 30, 2024.

Research Flow Chart

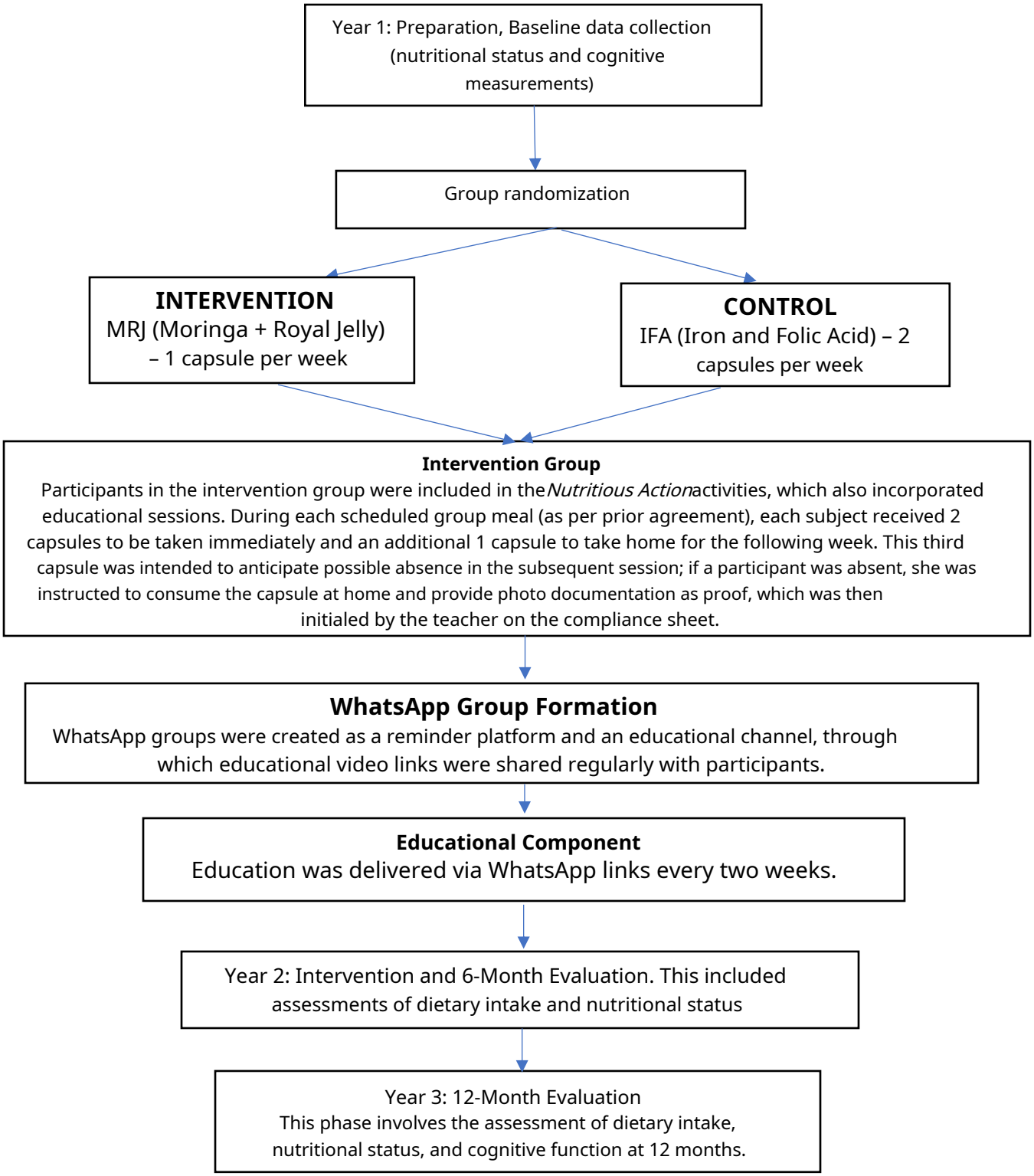

Figure 1. Research Flow Diagram

Research Timeline

In the first year, the study begins with field preparation activities, including coordination with schools, healthcare personnel, and enumerators. This was followed by the collection of baseline data to assess the nutritional status and cognitive function of adolescent girls. The collected data were then analyzed during the baseline data analysis phase and used to prepare the initial findings report. The baseline results also served as the foundation for developing journal articles and scientific publications. At the end of the first year, the intervention phase was initiated, accompanied by a monitoring process of capsule consumption by participants.

In the second year, activities commenced with intervention preparation, followed by full implementation of the intervention. A midline evaluation was conducted in the sixth month to assess the preliminary effects of the intervention on dietary intake and nutritional status. The data from this evaluation were analyzed in the six-month intervention data analysis phase and compiled into reports and scientific articles. Publication activities continued, along with the preparation and implementation of the 12-month intervention evaluation toward the end of the second year.

In the third year, the follow-up 12-month evaluation was carried out to assess the final outcomes on dietary intake, nutritional status, and cognitive function of adolescent girls postintervention. The data were analyzed in the 12-month intervention data analysis phase, and the results were compiled into the final report and scientific articles. The final stage of this research involved the dissemination of findings through publications in national and international scientific journals. Outcomes

Participant Characteristics

The study enrolled 372 participants, with a mean age of 14.5 years (±1.2). Baseline characteristics, including nutritional status, socioeconomic background, and dietary patterns, were comparable between the intervention and control groups.

Nutritional Status

Participants receiving MRJ supplementation showed significant improvements in weight-for-age and height-for-age Z-scores compared to the control group ($p < 0.05$). MUAC measurements also indicated better chronic energy deficiency outcomes in the intervention group.

Cognitive Function Scores

Cognitive function, as assessed by CFIT, improved significantly in the MRJ group compared to the control group.

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QUESTIONNAIRE

RESEARCH RESPONDENT CONSENT SHEET

"The Effect of Giving Moringa Oleifera Enriched with Royal Jelly on the Nutritional Status and Cognitive Level of Adolescent Girls"

The undersigned below:

Name :

Age :

Phone number :

Address :

I hereby declare that I have received an explanation and the opportunity to ask questions about things I do not understand about this research. This explanation includes the objectives, benefits, and effects of this research. This research procedure will take 12 months.
After receiving the explanation, I hereby agree to participate in this study and am willing to follow the blood sampling procedure, cognitive function measurement voluntarily and without coercion. I have the right to withdraw if the reason is related to my health.

Thus I make this statement in truth.

Takalar 2024

Respondents/ Students

(.....)

QUESTIONNAIRE FOR NUTRITIONAL INTERVENTION RESEARCH FOR ADOLESCENT GIRLS ANEMIA

In Takalar Regency in 2024

BLOCK I. DATA COLLECTOR DESCRIPTION			
1	Data collection date		□□-□□-□□□□
2	Name		
3	Mobile phone number		
BLOCK II. CHARACTERISTICS OF SUBJECTS AND PARENTS			
1	Name		
2	Date of birth		□□-□□-□□□□
3	Age		
4	School name		
5	Class (school)		
6	Home address		
7	Phone number		
8	Number of Family Members Living at Home		☐☐
9	What order do you come in your family		☐☐
10	How many brothers and sisters do you have		
		Father	**Mother**
11	Name		
12	Mobile phone number		
13	Date of birth	□□-□□-□□□□	□□-□□-□□□□
14	Father's Education		☐☐
15	Mother's Education		☐☐

Education Options

No/Not YetAt School

Not graduated from elementary school/Islamic elementary school

Graduated from Elementary School/Islamic Elementary School

Graduated from junior high school/Islamic junior high school

Graduated from high school/Islamic high school

GraduatedDI,DII,DIII

GraduateDIV/PT

Job Options

1.Doesn't work
2. School
3.Civil Servants/TNI/Polri/BUNM/BUMD
4. Private employees
5.Self-employed
6. Farmer/ Farm Worker
7.Fisherman
8.Laborer/Driver/Motorbike Taxi/Maid

Family Income Options 1.

0 - Rp. 500,000.00

2. > Rp. 500,000.00 – Rp. 1,000,000.00
3. > Rp. 1,000,000.00 - Rp. 2,000,000.00
4. > Rp 2,000,000.00 – Rp 3,000,000.00
5. > Rp. 3,000,000.00 – Rp. 4,000,000.00
6. ≥ Rp 4,000,000.00P

16	Father's occupation	☐☐
17	Mother's Job	☐☐

18	How Much is the Family Income?	
19	What is the main type of water source for all your household needs? (mark one option): a. Tap water/PDAM f. Protected springs b. Retail tap water/purchased g. Unprotected springs c. Boreholes/pumps h. Rainwater storage d. Protected dug wells i. River/lake/irrigation water	
20	How is the use of household defecation facilities? a. Owned by yourself d. Shared with a neighbor b. Shared with others e. None	
21	How many times does the family provide food in a day?	
BLOCK III. PMS Status of Adolescent Girls		
1	Have you menstruated yet? 1 = Yes, 2 = Not yet	
2	When did you first have your period? (dd-mm-yr)	
3	How long is menstruation?	
4	Complaints 1-2 weeks before menstruation (1 = Yes, 2 = No)	
5	Menstrual complaints (1 = Yes, 2 = No)	
6	Mother/sister experiences complaints during menstruation	
PMS Symptom Scale 1 = Not experienced, Scale 2 = Very light, Scale 3 = Light, Scale 4 = Moderate, Scale 5 = Severe, Scale 6 = Extreme		
1	Breasts feel sore, tense, enlarged or swollen	
2	Feeling unable to adjust or overwhelmed in daily activities	
3	Feeling stressed	
4	Easily offended or easily angered	
5	Feeling sad or disappointed	
6	Back pain, aches or stiffness in the joints	
7	Weight gain	
8	Stomach feels sore or uncomfortable	
9	Swelling in certain areas of the body	
10	Feeling bloated	
BLOCK IV. Signature Compliance Questionnaire		
1	Have you ever received a signature?	1 YES, 2 NO
2	Do you currently have a signature?	1 YES, 2 NO
3	Since when did you get your signature?	
4	How many signatures were obtained?	1 tablet/week . . . . . monthly table
5	Have you ever taken TTD?	1 YES, 2 NO
6	Are you currently taking TTD?	1 YES, 2 NO
7	When do you take TTD?	Once a week Once every 10 days . . . . very

8	How long have you been taking TTD?	. . . . Sunday
9	How much TTD do you consume?	1 tablet/week 4 tablets/month
10	Reasons for Consuming:	
11	Reasons Not to Consume:	
12	**complaints when taking TTD**	

BLOCK V. Nutritional Status of Adolescent Girls

	Examination Date I	
1	Hb	g/dl
2	Height	
3	close body	
4	iLA	

Block VI Eating Patterns

1= Yes (always done 5-7 times/week)

2= Sometimes (3-4 times/week)

3= Rarely (times/week)

0= Never

1	According to you, what is meant by breakfast? Answer: ***Answer:****Breakfast is a meal eaten in the morning before starting activities.*	. Correct . Wrong	
2	How often did you eat breakfast in the last week?	the reason.....	
3	Does your family usually provide breakfast at home?	the reason.....	
4	When you don't have time for breakfast, you bring your own food or don't buy snacks at school.		
5	Do you like to snack?		
6	How many times do you snack in a day?		
7	What type of food do you most often eat as a snack?	1. Fried food 2. Chiki 3. Chocolate 4. Meatballs 5. Wafer 6. Biscuits	

		7. Etc., please mention	
8	What are 3 types of food you like?		

Block VII Physical Activity (IPAC)

The following questions will ask you about the time you spent being physically active during the past 7 days. Answer each question even if you do not consider yourself an active person. Think about activities you do while you are at work, as part of housework and yard work, traveling from place to place, and in your free time for recreation, exercise or sports.

1	During the last 7 days, on how many days did you do heavy physical activity? such as lifting heavy objects, climbing stairs, and mandatory sports during school hours (volleyball, fast cycling, digging and so on)	.....days of the week
2	How much time do you usually spend each day doing vigorous physical activity as part of your study activities?	_____hours / days _____minutes / day
3	What kind of strenuous activities do you do? 1. Lifting heavy loads 2. Aerobics 3. Fast cycling 4. others please specify	☐☐

Think about the moderate physical activity you did in the last 7 days. Moderate physical activity makes you breathe a little harder than usual. For example, carrying a light load, cycling or playing sports. Does not include walking. Moderate physical activity makes you breathe a little harder than usual

do it for at least 10 minutes.

4	During the past 7 days, on how many days did you do moderate physical activity such as carrying light loads, cycling regularly, or playing doubles tennis? Do not include walking.	_____days of the week
5	How much time do you usually spend doing moderate physical activity a day?	_____hours / days _____minutes / day
6	What kind of moderate activities do you do? 1. Carrying light loads 2. Leisurely cycling 3. Mopping 4. Washing 5. Others, please specify	☐☐
7	During the last 7 days, on how many days did you walk for at least 10 minutes at a time?	_____days of the week
8	How much time do you usually spend walking in a day?	_____hours / days _____minutes / day
9	How much time do you usually spend sitting on weekdays?	_____hours / days _____minutes / day

10	What kind of light activities do you do? 1. Sweeping 2. Walking 3. Others, please specify	☐☐

Block VIII Food Believe and Food Taboo

1	Are there certain types of food that you are prohibited from consuming? . Yes . No		☐☐
2	What foods are you not allowed to eat? weld :		
3	Are there any special foods that you consume at certain times (celebratory holidays/religious events/during menstruation, etc.)?	1. Yes, please specify 2. No Reason :	☐☐
4	Where did you get the information about consuming what is that special food?	1. Mother 2. Other family (father, brother, grandmother, etc.) 3. Neighbors 4. Peers 5. Others, please specify	☐☐
5	What are the 5 types of food that you often consume?		

Block IX PSP Teen Girls

Knowledge (1= YES, 2= NO)

1	dress neatly and cut nails*No*one of the healthy and clean living habits	
2	It is recommended that we drink 5 glasses of water every day	
3	Breakfast is needed as the main source of energy before starting daily activities.	
4	Indonesia has a balanced nutrition guideline consisting of four pillars of balanced nutrition, namely: consuming eating a variety of foods, doing physical activity, clean living habits, and monitoring body weight.	
5	Teenagers who don't like vegetables tend to be fat as adults	
6	It is recommended to do physical activity or exercise at least once a week for 1 hour.	
7	We don't need to limit our consumption of sugar, salt and fat because they are beneficial for our bodies.	
8	anemia is a condition with hemoglobin levels lower than normal values	
9	anemia/insufficient blood is caused by not eating enough foods rich in iron	
10	you and the symptoms of anemia that you see are fatigue, exhaustion, lethargy, inattention and weakness	

11	Anemia in adolescents can have an impact on the ability to concentrate.	
12	Teenagers experience menstruation so they need to be given additional iron (TTD)	
13	The correct way to wash your hands is to use running water and soap	
14	Lack of nutrition in adolescent girls can lead to malnutrition during pregnancy.	
15	If the environment is dirty and unhygienic, a person can easily catch a disease.	
Attitude (1= AGREE, 2= DISAGREE)		
1	Dressing neatly and cutting nails has no effect on my health.	
2	Drinking 5 glasses of water is enough to meet my needs	
3	Breakfast is important to me, because otherwise I will have difficulty concentrating at school.	
4	You don't need to worry if someone is tired, weak, lethargic and pale.	
5	I have to eat vegetables every day to improve my digestion	
6	I don't consider the nutritional and health information on food labels when choosing food.	
7	I will choose foods with less sugar, salt and fat, even though they are not as delicious as foods high in sugar, salt and fat	
8	I can apply the 4 pillars of balanced nutrition guidelines in everyday life.	
9	The balanced nutrition pyramid helps me choose the right foods	
10	Eating tofu and tempeh alone is enough to build cells and tissues in our bodies.	
11	I need to eat vegetables and fruit to avoid constipation	
12	If your hands don't look dirty, washing them with running water is enough.	
13	Now I don't have to worry about my nutritional status as a future parent.	
14	I need to pay attention to the cleanliness of the surrounding environment because it will affect my health.	
15	I don't consider the nutritional and health information on food labels when choosing food.	
Practice: a= Always, b= Often, c= Sometimes, d= Rarely, e= Never		
1	How often do you dress neatly and cleanly?	
2	How often do you drink 8 glasses of water per day?	
3	How often do you eat breakfast before 9 am?	
4	How often do you consume sources of iron (red meat, chicken liver, iron tablets)?	
5	How often do you eat vegetables?	
6	Do you read food labels before deciding to buy packaged food?	
7	How often do you drink sugary drinks?	
8	How often do you weigh yourself?	
9	How often do you use the balanced food pyramid as a food guide?	
10	How often do you consume animal protein sources? (eggs, red meat, chicken)	
11	How often do you do continuous physical activity for at least 30 minutes?	
12	How often do you eat fruit?	
13	Do you wash your hands after using the bathroom?	

14	How often do you search for nutrition and health information?	
15	Do you help clean up your environment?	
Block X Self Efficacy of Adolescent Girls **(1= SURE, 2= NOT SURE)**		
1	How confident are you that you can dress neatly and cleanly every day?	
2	How confident are you in drinking 8 glasses of water per day?	
3	How confident are you in having breakfast before 9 o'clock?	
4	How confident are you in consuming sources of iron at every meal (red meat, chicken liver, iron tablets)?	
5	How confident are you in eating vegetables at every meal?	
6	How confident are you in reading food labels before deciding to buy packaged food?	
7	How confident are you about weighing yourself once a month?	
8	How confident are you in using the balanced food pyramid as a food guide for each meal?	
9	How confident are you in consuming animal protein sources at every meal? (eggs, red meat, chicken)	
10	How often do you do continuous physical activity for 30 minutes every day?	
11	How confident are you in eating fruit at every meal?	
12	How confident are you in washing your hands after using the bathroom?	
13	How confident are you in helping clean your environment every day?	

FOOD RECALL FORM 1 x 24 HOURS

Name : .....

School/ Class : ..... Age :

.....

Time Eat	Dish				Material name food	URT	Estimate (grams)	Heavy Clean (grams)
	Name Food	Process Processing	Portion (in URT)	Estimate (grams)				
Morning								
Interlude								
Afternoon								
Interlude								
Evening								

Interlude								

FOOD FREQUENCY FORM

SQ-FFQ (*SEMI QUANTITATIVE FOOD FREQUENCY QUESTIONNARE*)

Name : .....

School/ Class : ..... Age :

.....

No	Food Names	Heavy (g)	Portion	Frequency				Portion			Flat-flat	Heavy
				x/H	X/M	x/B	No Prnh	K	S	B	x/H	g/H
Staple food												
1	White rice	200	1 person at the moment									
2	Yellow rice	200	1 person at the moment									
3	Fried rice	200	1 person at the moment									
4	Buras	95	1 pc									
5	Ketupat	110	1 pc									
6	White bread	30	2 slices									
7	Instant noodles	80	1 pack									
8	Potato	40	1 pc medium									
Animal Side Dishes												
9	Beef	35	1 pm today									
10	Beef liver	50	1 pm today									
11	Chicken meat	45	1 pm today									

12	Chicken liver	35	1 pc medium									
13	Rabbitfish	45	1/3 tail									
14	Flying fish	45	1/3 tail									
15	Snapper	45	1/3 tail									
16	Skipjack tuna	45	1/3 tail									
17	Milkfish	45	1/3 tail									
18	bete-bete fish	45	1 tail kcl									
19	Mairo fish	45	10 tail kcl									
20	Fish cake	50	1 pm									
21	Freshwater fish (tilapia fish, mas, catfish, etc.)	45	1/3 tail									
22	Fresh shrimp	35	4 tails sdg									
23	Crab	30	1 tail									
24	Clams/oysters	10	1 pc									
25	Squid	45	1 tail kcl									
26	Meatball	25	1 seed									
27	Sausage	20	1 seed									
28	Dried fish	20	11 tails									
29	Anchovy	15	2 tbsp									
30	Beef floss	10	2 tsp									
31	Egg chicken village	40	1 piece									
32	Chicken eggs	55	1 piece									
33	Duck eggs	60	1 piece									
34	Quail eggs	10	2 pieces									
35	Other											
Vegetable Side Dishes												
36	Know	110	1 pm bsr									
37	Tempeh	50	2 pm today									
38	Mung beans	15	1 tbsp									
39	Peanuts	15	1 tbsp									
40	Cashew nuts	15	1 tbsp									

41	Other ……											
Vegetables												
42	Spinach	50	1 prg									
43	Broccoli	100	1 gls									
44	Beans	50	7 pcs									
45	Cassava leaves	50	1 prg									
46	Corn	50	1/3 pm									
47	Mold	15	1 ½ tbsp									
48	Banana heart	15	1 tbsp									
49	Long beans	50	3 pcs									
50	Spinach	50	1 prg									
51	Cauliflower	20	2 tbsp									
52	Cabbage	50	1/8 pm									
53	Summer squash	50	1 pm today									
54	Chayote	50	1 pm today									
55	Cucumber	20	2 slices									
56	Young Jackfruit	20	2 tbsp									
57	Bamboo shoots	30	2 tbsp									
58	Mustard greens	50	1 prg									
59	Bean sprouts	15	1 tbsp									
60	Eggplant	50	½ hour									
61	Tomato	25	1 seed									
62	Carrot	50	½ pcs									
63	Other……											
Fruits												
64	Avocado	50	½ fruit									
65	Apple	75	½ fruit									
66	Guava	100	1 pc medium									
67	Orange	150	1 pc medium									
68	Ambarella	100	1 pc medium									
69	Mango	90	½ pcs medium									
70	Pawpaw	110	1 pm today									
71	Rambutan	75	5 pieces									
72	Watermelon	180	2 pm today									

73	Wine	125	11 pieces									
74	Pear	85	½ fruit									
75	Banana	50	1 piece									
76	Snakefruit	80	1 piece									
77	Durian	35	3 seeds									
78	Long-haired	75	5 pieces									
79	Melon	100	½ pg bsr									
80	Pineapple	95	¼ pcs medium									
81	Other											
Drinks & Supplements												
82	Milk powder	10	1 tbsp									
83	UHT Milk	200	1 gls									
84	Soy milk	200	1 gls									
85	Milk thick sweet	10	1 tbsp									
86	Milo cans	240	1 set									
87	Milo sachet	14	1 pack									
88	Frisian flag	190	1 box									
89	Energen	30	1 pack									
90	Cheese	10	1 tbsp									
91	Ice cream	125	1 cup									
92	Ice cream stick (Feast, Paddle pop, etc.)	65	1 pack									
93	Signature Supplement		1 tablet									
Snack Food												
94	Donuts	65	1 pc									
95	Rissoles	50	1 pc									
96	Pudding	65	1 pc									
97	Brownies	30	1 pc									
98	Fried sweet potatoes	60	1 pc									
98	Fried breadfruit	13	1 pc									
100	Fried bananas	60	1 pc									
101	Fritters	40	1 pc									
102	Corn fritters	40	1 pc									

103	Bright moon	50	1 pm today									
104	Pancakes	40	1 pm today									
105	Green banana	60	1 pc									
106	The hammer is broken	220	1 mgk									
107	Tella tella	120	1 prg									
108	The Road	65	1 pc									
109	Know the contents	20	1 pc									
110	chicken Soto	225	1 mgk									
111	Coto	400	1 mgk									
112	Meatball noodles	370	1 mgk									
113	Dumplings	390	1 mgk									
114	Mixed vegetables with the peanut sauce	430	1 prg									
115	Batagor	220	1 prg									
116	dumpling	160	1 mgk									
117	Titi noodles	400	1 prg									
118	Chicken satay	80	5 tsk									
119	Other											

RAYMOND B. CATTELL

KAREN S. CATTELL

CFIT

SKALA 3 BENTUK A

PENGGUNAAN TERBATAS
HANYA OLEH PSIKOLOG

LEMBAGA PENGEMBANGAN
SARANAN PENGUKURAN DAN PENDIDIKAN PSIKOLOGI
FAKULTAS PSIKOLOGI - UNIVERSITAS INDONESIA
1996

JANGAN MENULIS ATAU MEMBUAT
CORETAN DI DALAM BUKU INI

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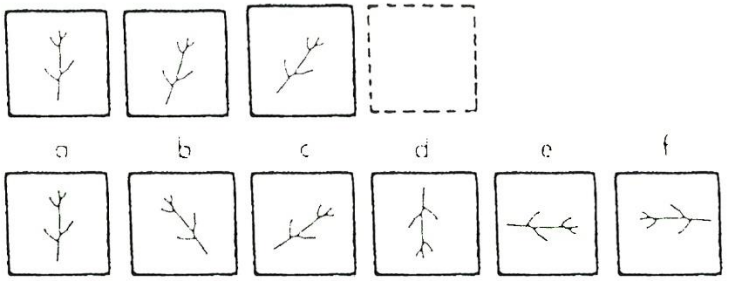

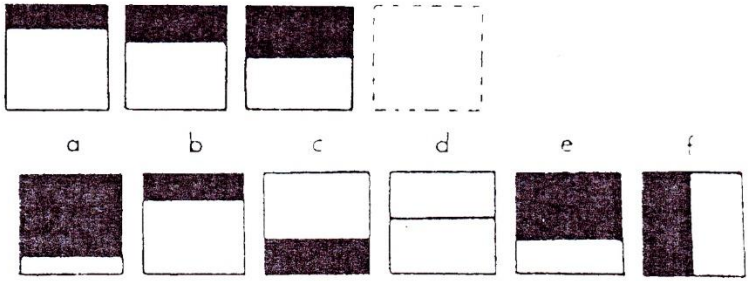

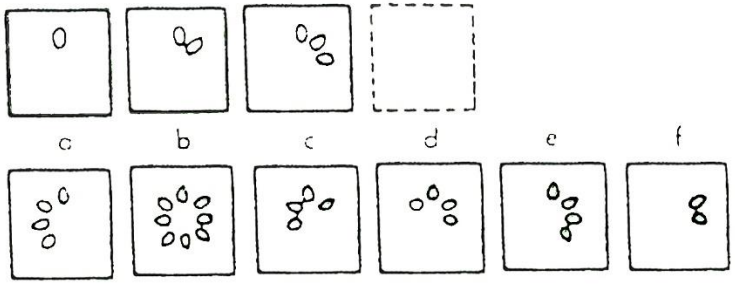

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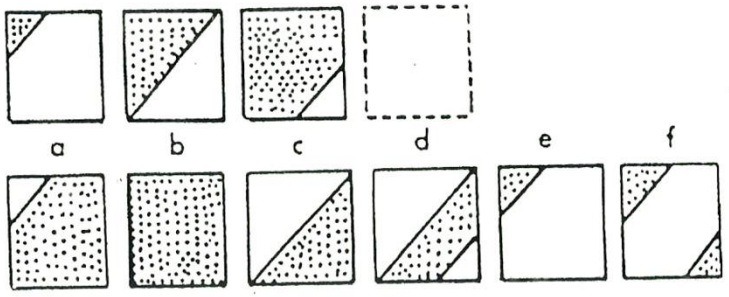

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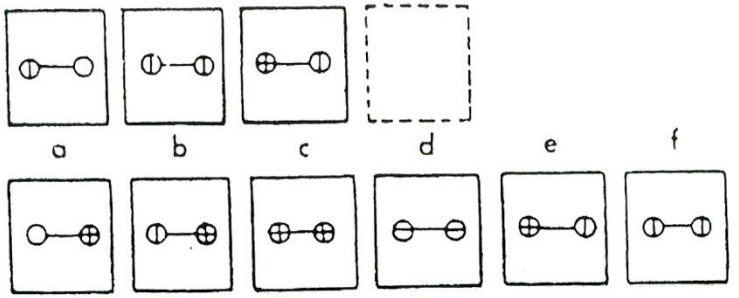

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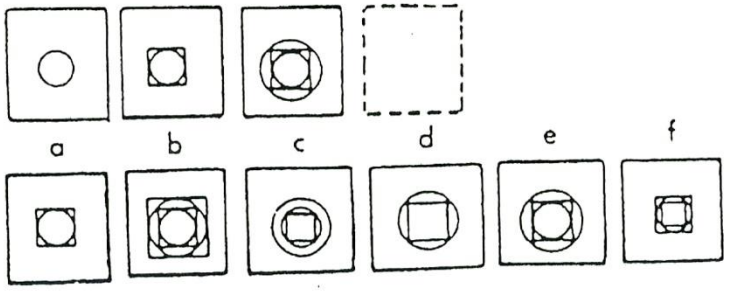

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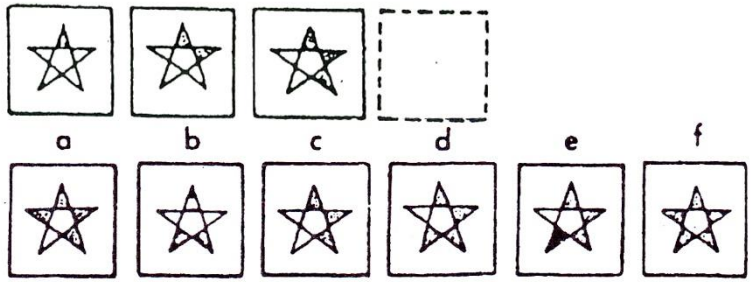

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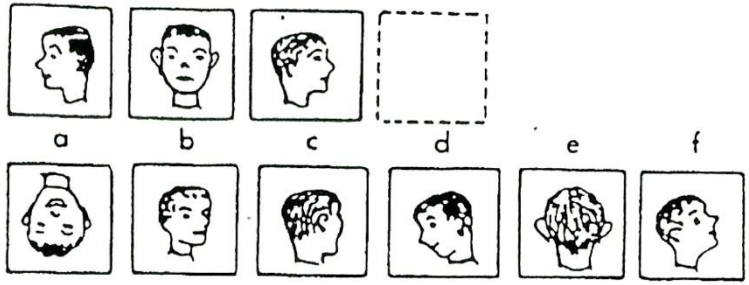

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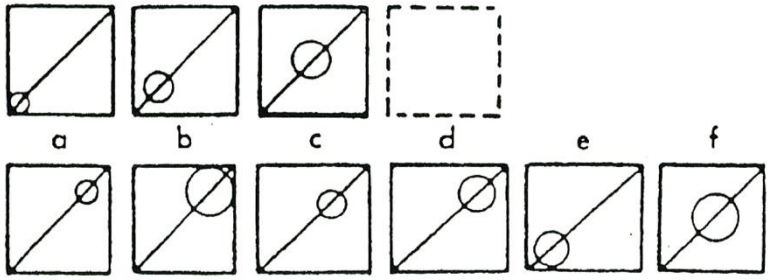

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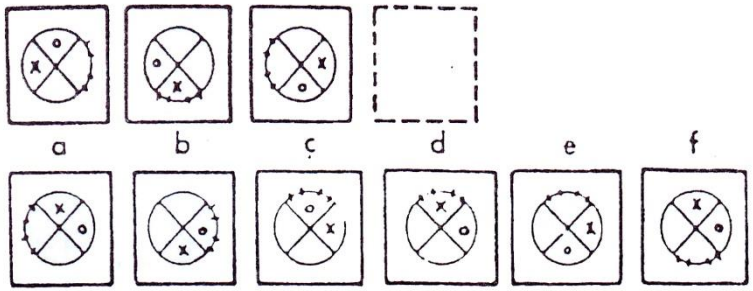

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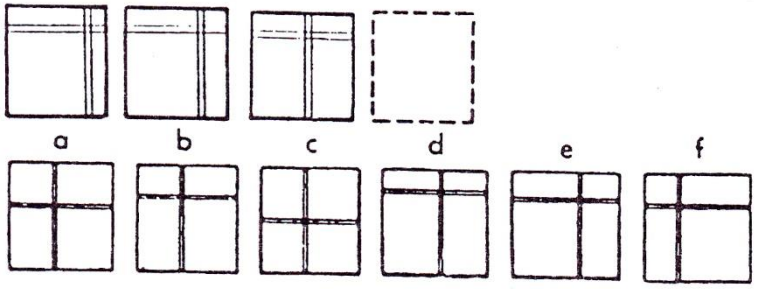

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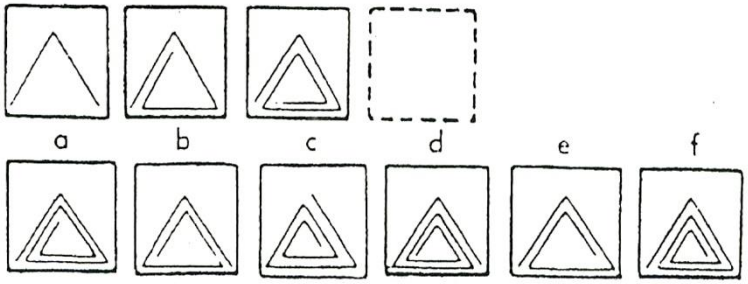

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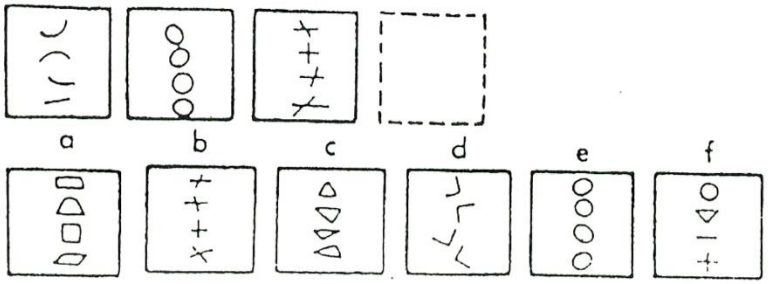

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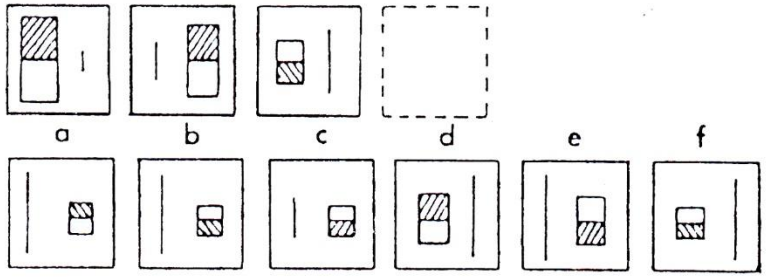

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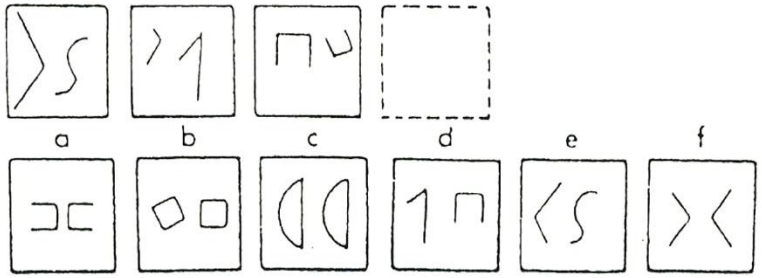

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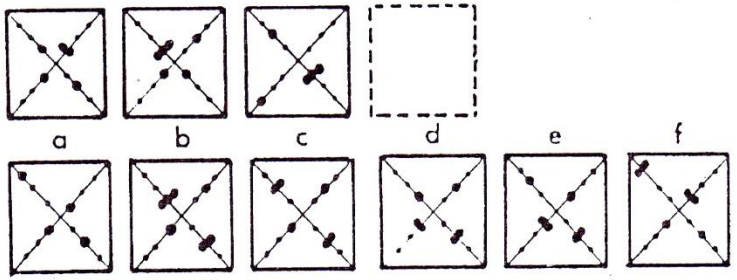

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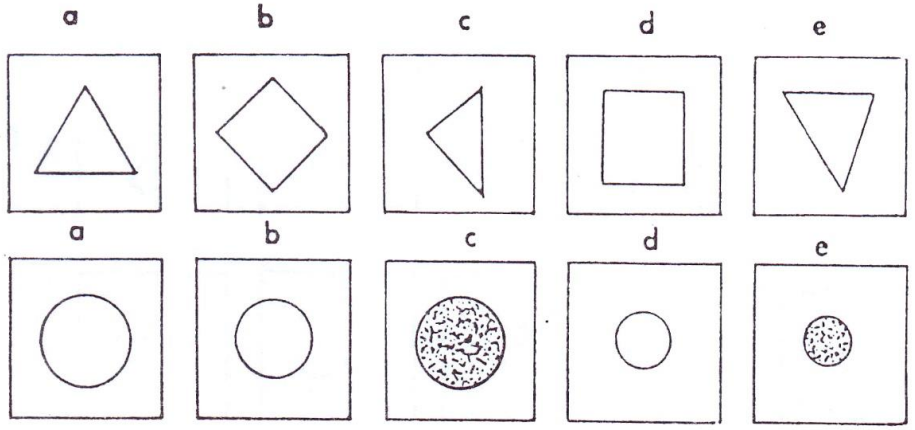

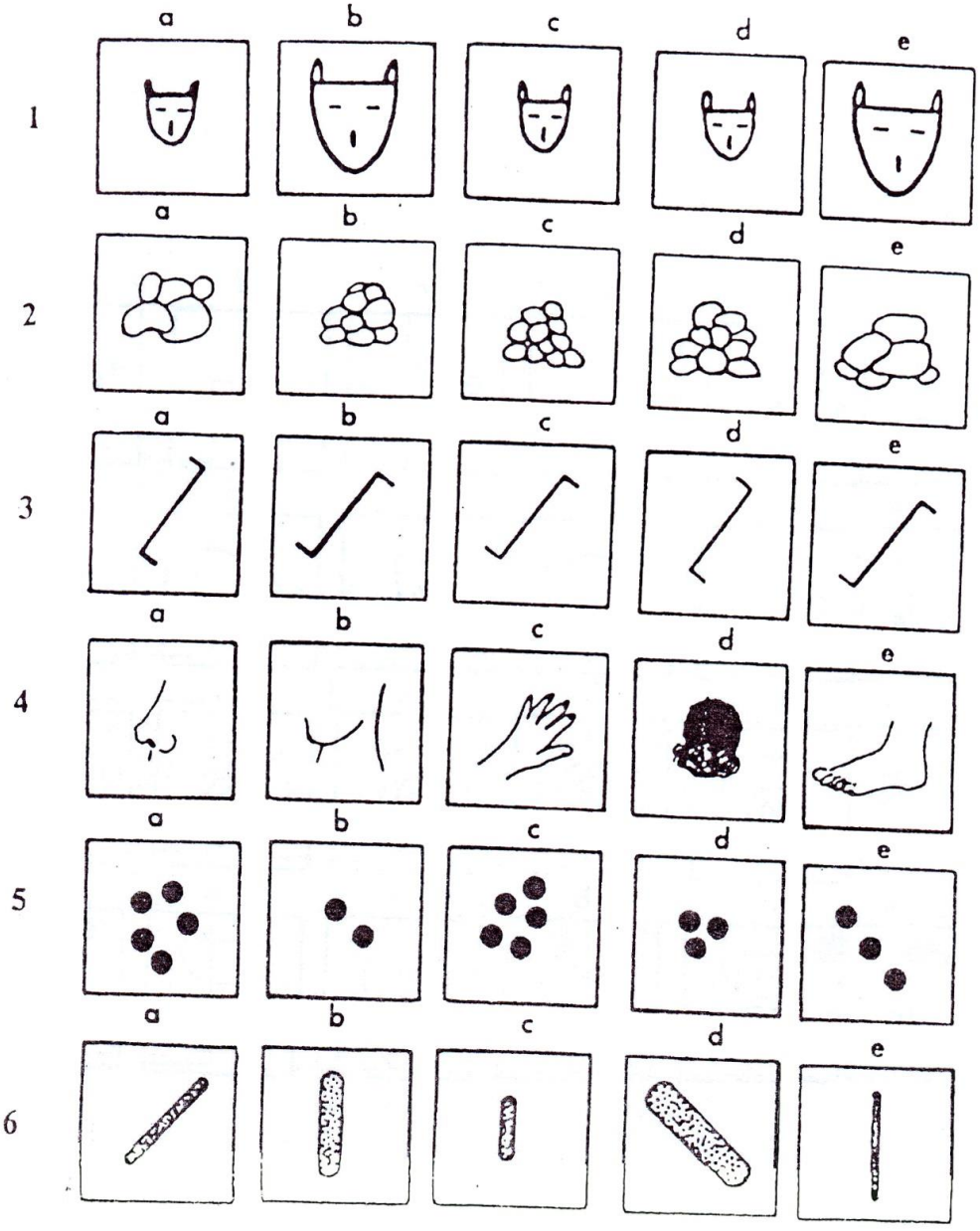
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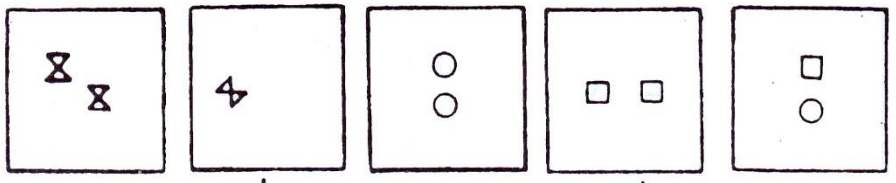

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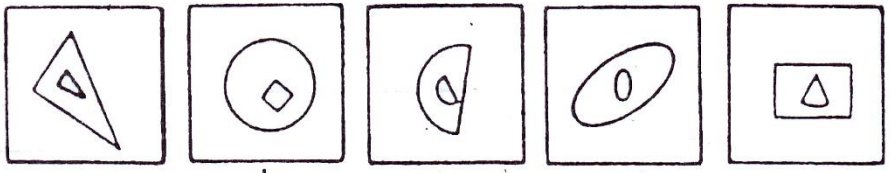

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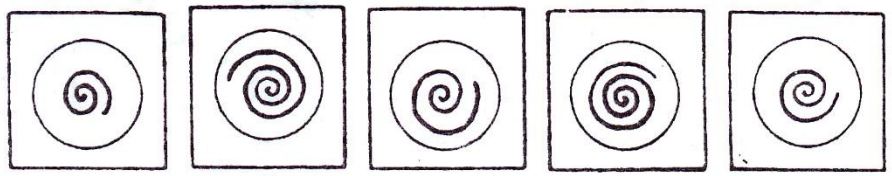

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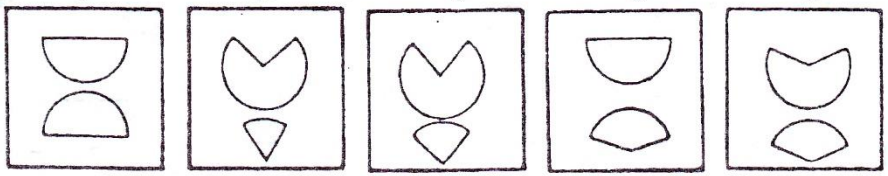

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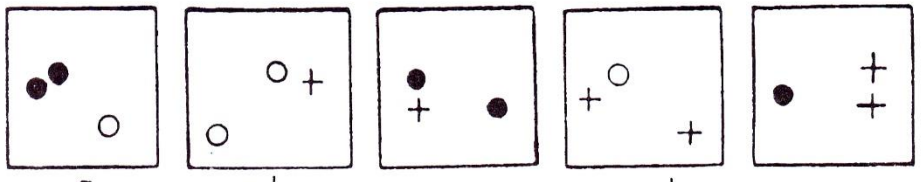

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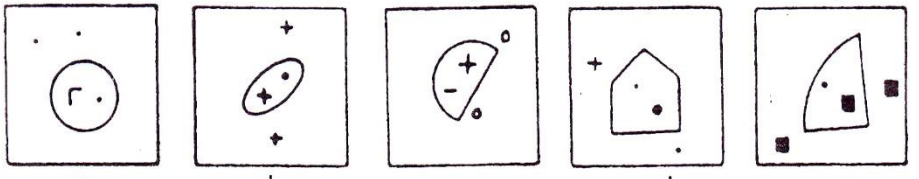

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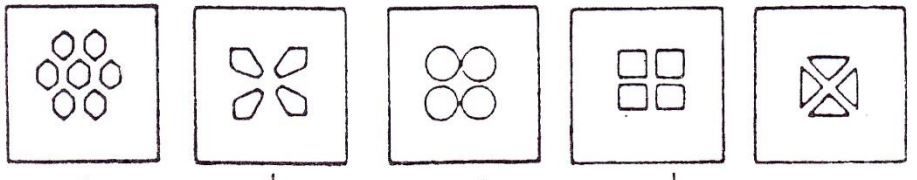

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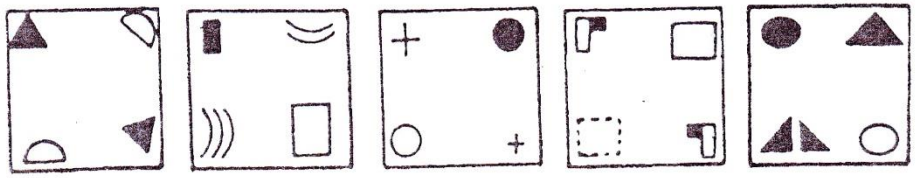

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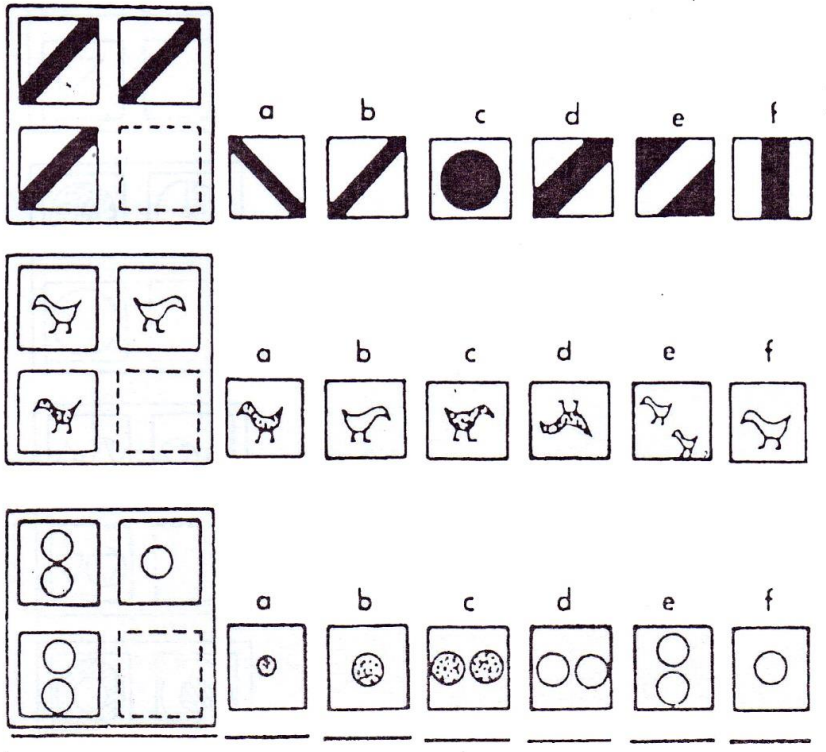

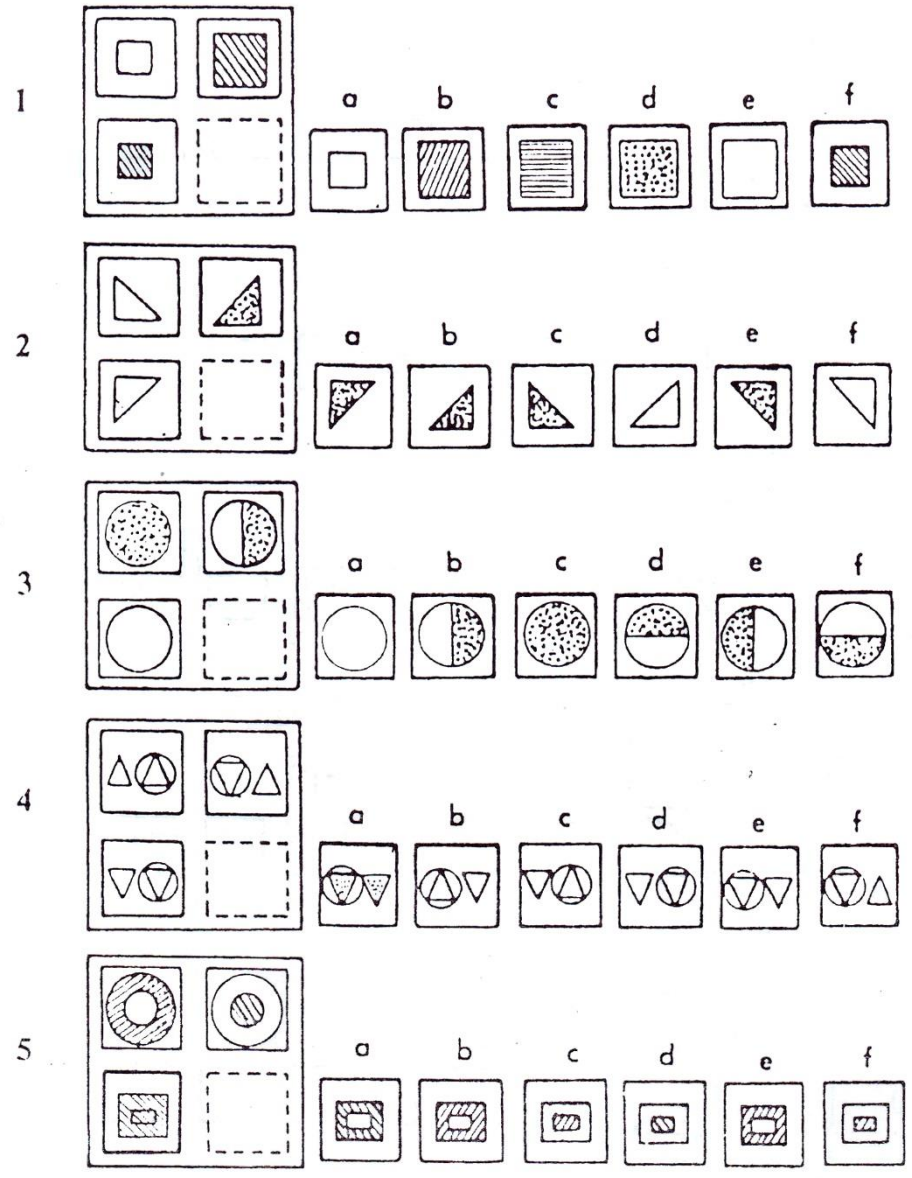
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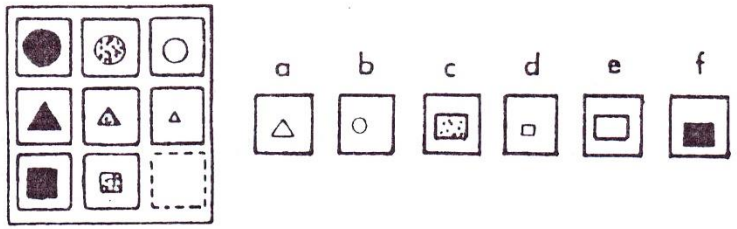

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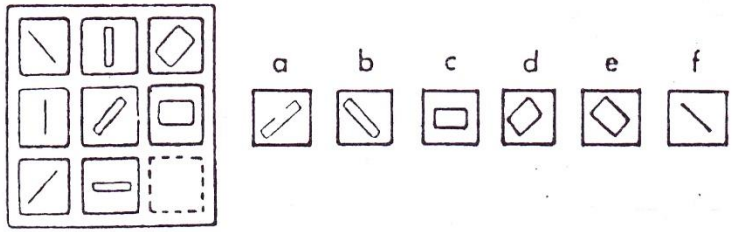

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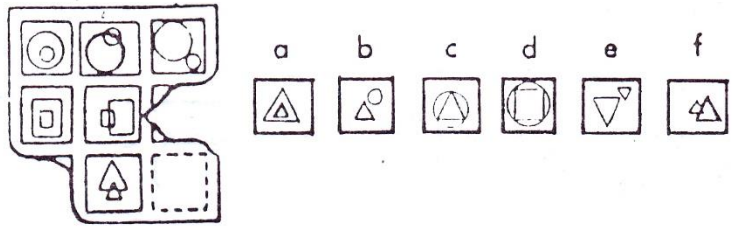

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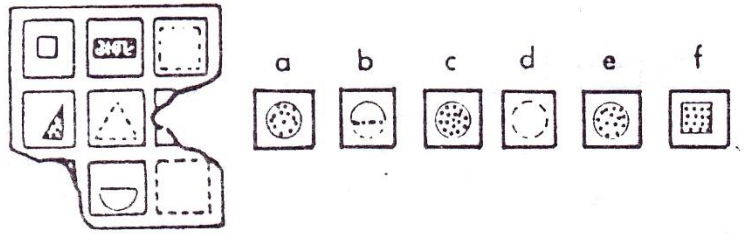

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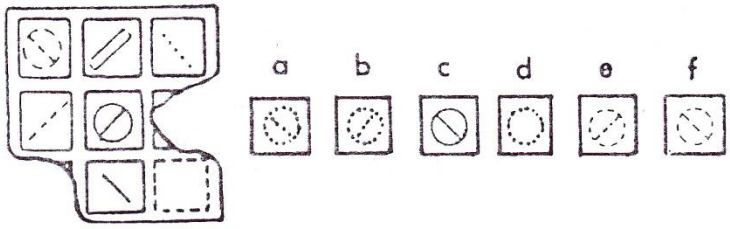

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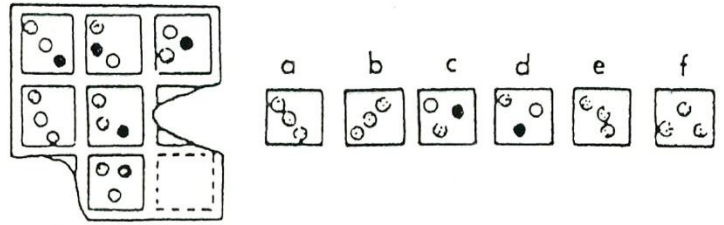

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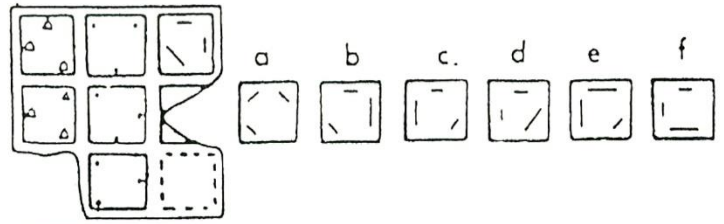

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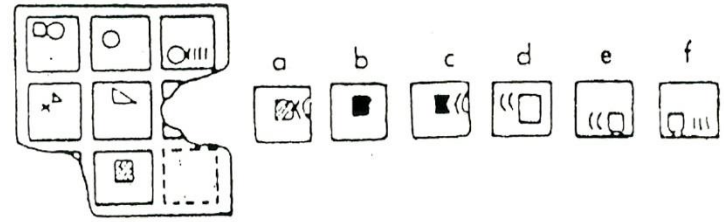

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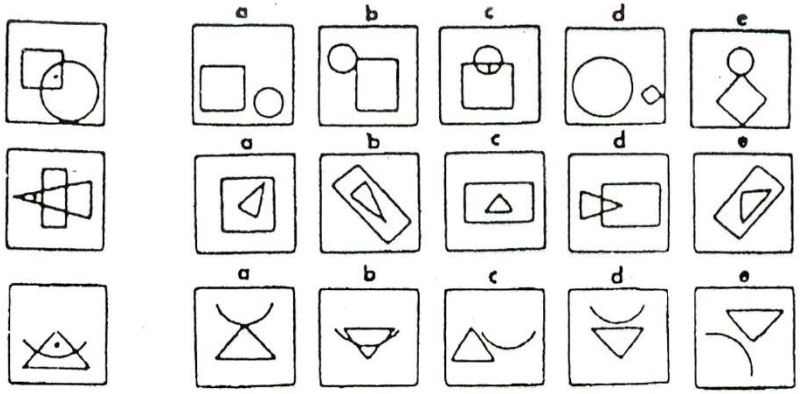

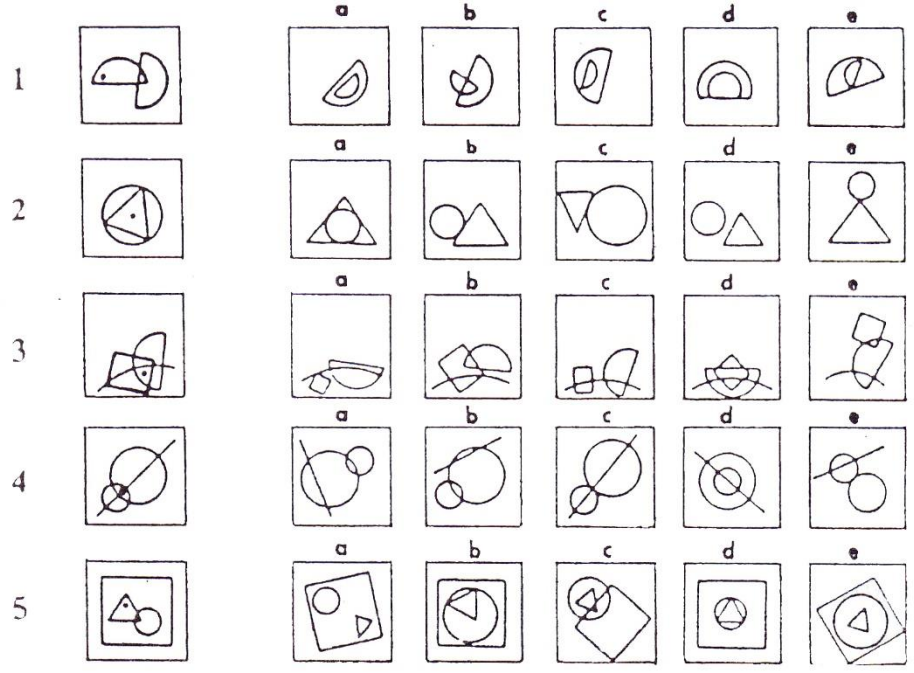
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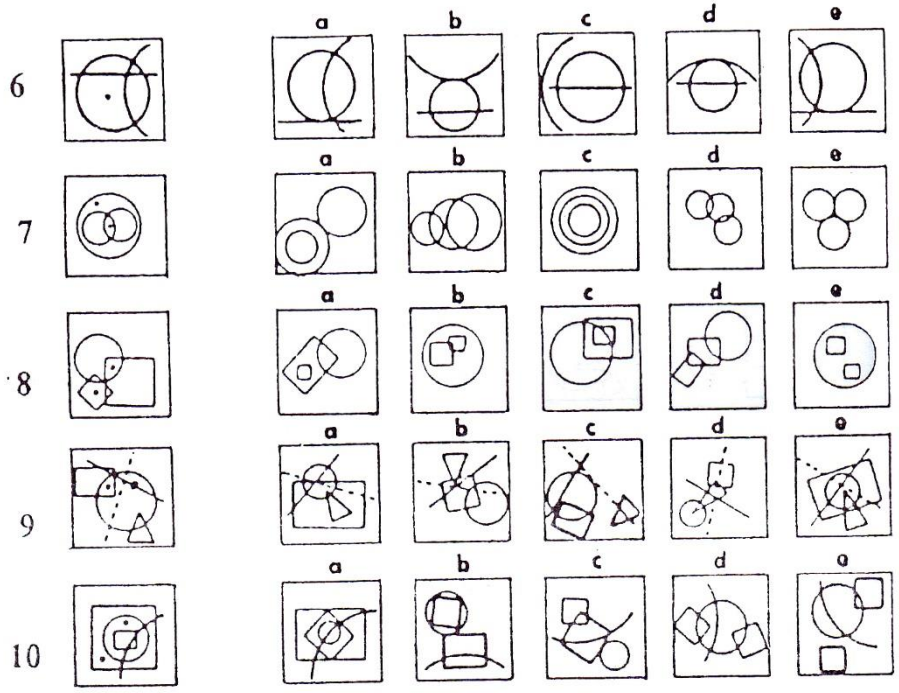

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