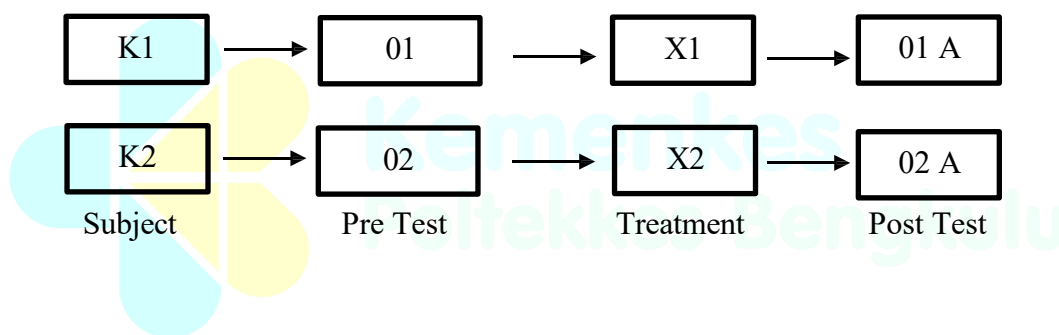


CHAPTER IV

RESEARCH METHODS

A. Types of Research

This type of research is included in the category of quantitative research with a *quasi experimental* approach. The research design used was a *pre-post test design with control group* research. This study aims to determine the effect of *Brain Gym* therapy and *Puzzle therapy* on improving cognitive function in the elderly in the working area of the Jembatan Kecil Health Center in Bengkulu City in 2026. Respondents in this study were divided into two groups, namely the intervention group and the control group.



Bagan 4. 1 Research Design

Description :

- K1 : Intervention group respondents
- K2 : Control group respondents
- 01 : Measurement of cognitive function before *Brain Gym* therapy and *Puzzle therapy* in the intervention group.
- 02 : Measurement of cognitive function before *memory training* in the control group.
- X1 : Treatment Group Intervention given therapy *Brain Gym* and therapy *Puzzle*
- X2 : Control group treatment is given *Memory training*.
- 01A : Measurement of cognitive function after therapy

Brain Gym and *Puzzle therapy* in the intervention group.

02A : Measurement of cognitive function after performing *Memory training* in the control group

B. Research Variables

This study consists of independent variables (independent variables) and dependent variables (bound variables). The independent variables of the study were *Brain Gym* and *Puzzle therapy*. Meanwhile, the dependent variable is cognitive function, with characteristics including age, education level, and disease history. This study used two groups, namely the intervention group received *Brain Gym* therapy and *Puzzle* therapy, while the control group received *Memory Training therapy*.

C. Research Location and Time

1. Research Location

This research was carried out in the Bengkulu City Small Bridge Health Center Working area.

2. Research Time

This research has been carried out from February 20 to April 30, 2026.

D. Population and Sample

1. Populasi

The population in this study is all elderly people in the Bengkulu City Small Bridge Health Center area in 2026. The number of elderly people in the Bengkulu City Small Bridge Health Center area in 2025 is 2,948 people, with details of 1,375 elderly men and 1,573 elderly women (Bengkulu City Small Bridge Health Center, 2026).

2. Sample

Sample selection was carried out by *the Probability sampling* method, which shows that the sample was selected randomly. The sample in this study is some elderly people who meet the predetermined criteria and are recorded at the Bengkulu City Small Bridge Health Center. The method chosen is *Simple Random Sampling* where the sampling technique of each

member of the population has the same opportunity and the same probability to be selected as part of the sample. This method does not consider the division of the population into certain groups or strata, with inclusion and exclusion criteria, namely:

a. Criteria including:

- 1) Willing to be a respondent
- 2) Seniors aged 55-65 years
- 3) Elderly in a calm/comparative psychic state
- 4) Elderly who do not have physical disabilities
- 5) The elderly who have a good sense of hearing and vision; and
- 6) Elderly with mild to moderate cognitive impairment with a score of 11-26.

b. Exclusion criteria:

- 1) Respondents who do not want to complete therapy; and
- 2) Respondents experienced health/physical disorders that resulted in being unable to continue physical activity.

The calculation of the number of samples in this study uses a formula for two paired means, namely:

$$\left[\frac{n = \sigma^2 (Z_{2\alpha} + Z_{1-\beta})^2}{(\mu_1 - \mu_2)^2} \right]$$

Description:

N = Sample size

$Z_{1-\alpha}$ = Confidence level of Z value at (1.96)

-2

$Z_{1-\beta}$ = Test Strength 95% Standard Deviation (0.84)

μ_1 = Mean value in the intervention group obtained from the literature

μ_2 = Mean value in the control group obtained from the literature

σ = Estimation of post-test deviation based on literature

Based on research conducted by (Kustianah and Waliyanti, 2023) About "Drawing Therapy and Brain Gymnastics as an Intervention on Cognitive Function in the Elderly with Dementia", the mean value in the intervention was 20.1 ± 2.20 and the increase after the intervention was 25.75 ± 1.5 , the difference in cognitive function in the intervention group before and after was 5.65 ± 0.7 . Meanwhile, in the control group, there was a decrease, the average results of the respondents' cognitive function before 18.75 ± 2.4 and after 18.375 ± 4.41 , the difference in cognitive function in the control group before and after was 0.38 ± 2.01 . While the standard deviation of the intervention and control groups ($Sd1 = 4,951$ and $Sd2 = 2,367$).

1. Finding σ^2

$$\sigma^2 = Sd1 - Sd2$$

$$\sigma^2 = 4,951 - 2,367$$

$$\sigma^2 = 2,584$$

2. Search n

$$n = 2 \cdot \sigma^2 \frac{(Z1 - \frac{\alpha}{2} + Z1 - \beta)^2}{(\mu1 - \mu2)^2}$$

$$n = 2,584 \cdot \frac{(1,96 + 0,84)^2}{(22,6 - 19,41)^2}$$

$$n = \frac{6,677056 (7,84)}{(2,65)}$$

$$n = \frac{52,348119}{2,65}$$

$$n = 19,7540072$$

$$n = 20$$

3. Finding (n) With Drop Out $n' = n / (1-f)$

$$n = 19,7540072 / (1-0,1)$$

$$n = 19,7540072 / 0,9$$

$$n = 21.9488969$$

Total samples = 22

The total sample was 44 people consisting of 22 people from the intervention group and 22 people from the control group.

E. Data Collection

1. Data Source

a) Data Primer

Primary data, namely data obtained directly by researchers from respondents through interviews which include:

- 1) Data was taken directly from respondents who lived in the Jembatan Kecil health center area, Bengkulu city.
- 2) The researcher explained to the prospective respondents about the objectives and asked for approval to become a respondent. If the prospective respondent refuses, then the researcher will stop the research to the prospective respondent, but if the prospective respondent wants, the researcher will ask the prospective respondent to sign a letter of approval to become a research participant.
- 3) Characteristic data in the form of name, age, education level, disease history by way of interviews and observation sheets were given.
- 4) Explain to respondents the purpose, benefits, and duration of the research.
- 5) The researcher measured cognitive function using the *Mini Mental State Exam (MMSE) questionnaire* with a score range of 11-26 for prospective respondents, if the prospective respondents met the requirements and inclusion criteria set by the researcher, they would be planned as respondents.

b) Data seconds

Secondary data is data obtained by researchers from existing data. The researcher obtained data on the number of elderly people from the Bengkulu City Small Bridge Health Center.

2. Data Collection Tools

The tool used is a questionnaire sheet *Mini Mental State Examination* (MMSE) that have been tested for validity and reliability (Komala et al., 2021).

3. Test Data Collection Tools

The test of the data collection tool has been tested for its validity and reliability, the MMSE validity test obtained a value of $r: 0.776$ and the reliability test obtained a value of $r: 0.827$ so that the MMSE questionnaire is declared valid and reliable for use (Komala et al., 2021).

4. Data Collection Procedure

The way to collect data in this study is as follows:

- a. Respondent characteristic data was collected through interviews and filling out observation sheets.
- b. To perform actions in accordance with *the Brain Gym* procedure/sop sheet and *Puzzle therapy*.
- c. For the measurement of cognitive function, an observation sheet was used with interviews using *the Mini Mental State Examination (MMSE) questionnaire* with a score range of 11-26.

F. Research Instruments

The research instruments used are *Mini Mental State Examination* (MMSE) which consists of 11 questions about: time orientation, place orientation, registration, calculation and attention, remembering, language (naming objects, word repetition, three-step command, closing eyes command, command to write sentences, command to copy images Abilities visuospatial) The maximum score is 30 (thirty). The interpretation of the MMSE measurement is that if a score of 27-30 points means that there is normal or no impairment of cognitive function (*normal cognitive function*), mild cognitive impairment (*mild cognitive function impairment*) if the score obtained is 21-26 points, moderate cognitive impairment (*moderate cognitive function impairment*) with a score of 11-20 points, and severe cognitive impairment (*severe cognitive function impairment*) with a score of 0-10 points (Komala et

al., 2021).

G. Data Processing

The data that has been collected is processed using a computer, with the following stages:

1. *editing*; The results of the observation sheet in the field are edited first. The sheets that have been collected will be checked again for completeness of the data.
2. *Coding*; After all the observation sheet data is checked, the next step will be *done Coding* (marking code).
3. *Sorting*; The data were then grouped according to the respective codes in the intervention group.
4. *Data Entry and Processing*; The answers of each respondent are entered in the program or letters into numerical or numerical data.
5. *Cleaning*; After all the data is entered, the data is checked again to see for possible code errors, incompleteness and so on, then corrections or corrections are made. This process is called data *cleaning*.

H. Data Analysis

1. Univariate Analysis

Univariate analysis was carried out to describe the characteristics as well as independent and dependent variables. For numerical variables such as age and cognitive function before and after the intervention, this analysis will be used to calculate Mean, SD, Median, Max-Min, and 95% CI values for Mean. Meanwhile, for categorical variables such as gender, education, and disease history, the analysis will be carried out using frequency distribution. The data presentation of each variable will be presented in a table, and interpretation will be presented based on the results obtained.

2. Bivariate Analysis

The bivariate analysis in this study began with an equivalence test of the two data groups and a data normality test with *the Shapiro-Wilk* test. To determine the difference in the average *pre-test* and *post-test* cognitive

function scores in the intervention group, *the Wilcoxon test* was used because the data were not normally distributed. Meanwhile, to find out the difference in the average *pre-test* and *post-test* cognitive function scores in the control group, *the Paired Sample T-Test test* was used because the data was normally distributed.

Furthermore, to determine the effect and difference in the effectiveness of *Brain Gym* therapy and *Puzzle* therapy between the intervention group and the control group given *memory training*, *the Mann-Whitney test* was used . The use of the *Mann-Whitney* test is because one of the groups had data that was not normally distributed, with a confidence level of 95% ($p = 0.05$)."



I. Research Flow

Before collecting research data, the researcher conducts research stages ranging from sample selection to respondent identification. The stages of research implementation can be seen from the following chart:

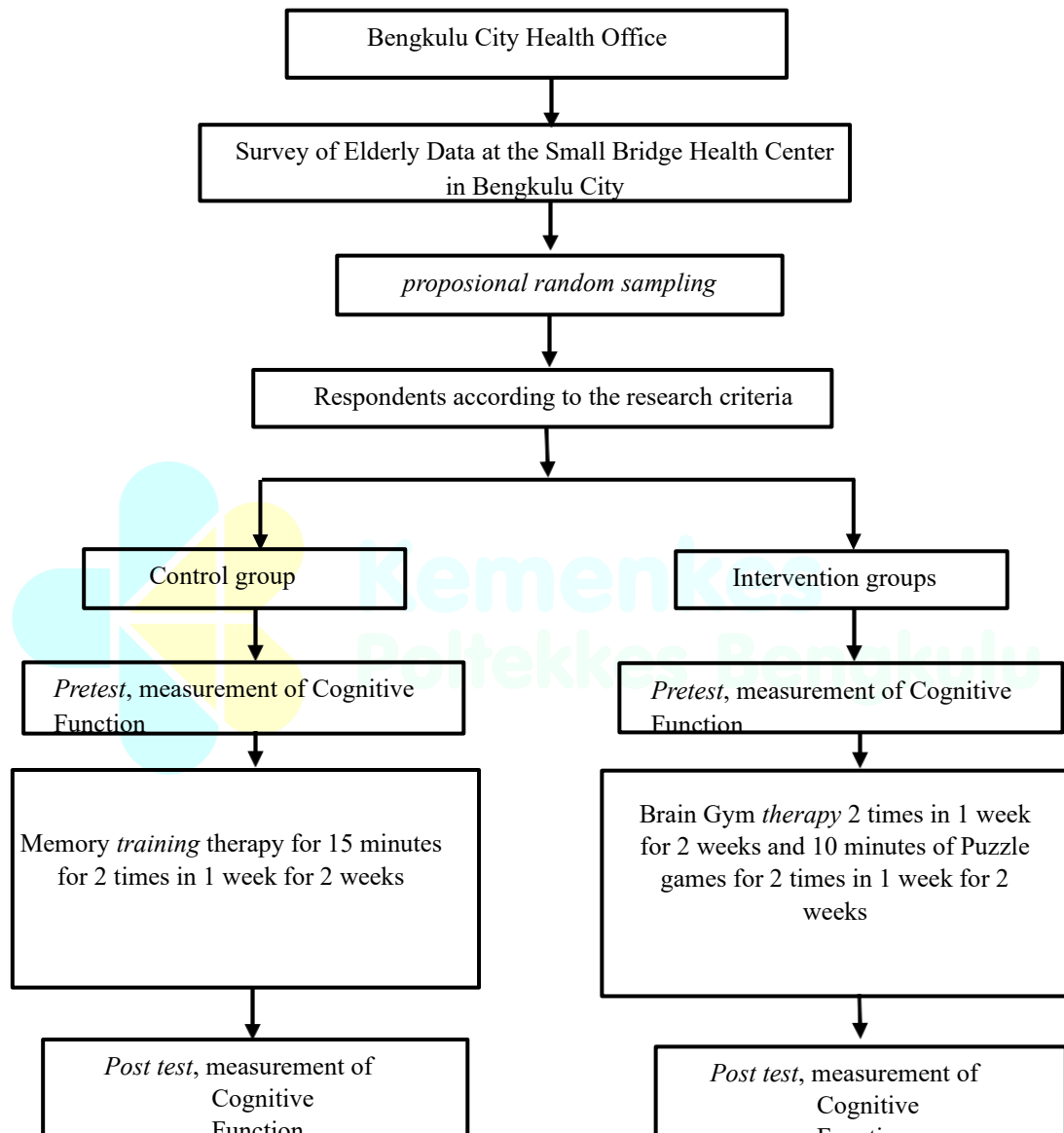


Chart 4. 2 Research Flow

J. Research Ethics

The research will consider the ethics and legality of the research to protect respondents from all dangers and physical and psychological discomfort (Nursalam, 2020) The researcher carries out an ethical evaluation through the ethics committee of the Bengkulu Ministry of Health Polytechnic considering the following matters:

1. Right to participate/not be a respondent (*Self determinant*)

In this study, respondents were given freedom to choose and decide whether or not to participate without coercion.

2. *Anonymity*

The respondent's name was listed with the initials on the observation sheet and the researcher only used a number code. The signature is included on the approval sheet made in writing.

3. Confidentiality

All information that has been obtained from the respondent can be guaranteed confidentiality and will not be disseminated or disclosed to others. The researcher stores the data in the form of a soft file that is downloaded by the researcher and only exists on the researcher's drive.

4. Keadilan (*justice*)

The principle of justice fulfills the principles of honesty, openness and prudence. The researcher must guarantee the rights of the respondents that he or she deserves to receive fairly and in accordance with the stipulations made by the researcher and the respondent before conducting the research.

5. The Principle of *Beneficiation*

Respondents who participated in this study benefited from improving cognitive function.

6. *Non-Maleficence*

Guarantee that the study does not cause discomfort, harm, or harm the respondent either physically or psychologically.