

## CHAPTER II

### LITERATURE REVIEW

#### 2.1 Elderly Concept

##### 2.1.1 Definition of Elderly

*World Health Organization (WHO)* says that elderly can be defined as individuals who have reached the age of 60 years or more and this includes the age group where people have entered the final stage of their lives.

Elderly (Elderly) is one of the stages of aging, namely the process that occurs with increasing age, characterized by a decrease in the function of various organs of the body, including the brain, heart, liver, and kidneys, as well as a decrease in active body tissue, such as muscles (Meliana et al., 2019). Elderly is also defined as individuals who are over 60 years old experiencing a gradual process that causes cumulative changes, including decreased endurance. (Wulandari et al., 2023).

##### 2.1.1 Classification of the Elderly

*World Health Organization (WHO)* groups the elderly based on their age as follows:

1. *Middle Age* (Middle Age) : 45 to 59 years
2. *Elderly* (Elderly) : 60 to 74 years
3. Old (Old Age) : 75 to 90 years
4. Very Old (very old) : >more than/90 years

According to the Indonesian Ministry of Health (2013), the classification of the elderly consists of the following categories:

1. Pre-elderly refers to individuals who are in the age range of 45 to 59 years.
2. Elderly refers to individuals who have reached the age of 60 years and above.
3. Elderly people are individuals aged 60 years and over and often face various health challenges.
4. Potential elderly are individuals aged 60 years and over who are still able to work or be active in producing goods or services.
5. Potential elderly are elderly individuals who are still able to carry out work or activities that produce goods or services.
6. Non-potential elderly are elderly individuals who are unable to earn their own living and depend on the help of others to meet their living needs.

#### 2.1.2 Theory of Aging Process

Aging is a condition in which body tissues experience a decline in their ability to repair themselves. This process occurs continuously and is a natural part of the stages of human growth and development. (Ratnawati, 2017).

1. Biological Theory
  - a. Genetic Theory
    - 1) Genetic clock theory

The Genetic Clock Theory states that genes play a role in regulating and controlling the aging process. Each species has unique characteristics of the cell nucleus and a certain age range, known as the genesis clock, which determines the frequency of cell mitosis. This theory is based on the fact that life expectancy varies between species. (Ratnawati, 2017).

2) Somatic mutation theory

This theory relies on the fact that body cells (somatic) can undergo mutations when they are in unhealthy conditions. This process involves errors in the transcription of DNA or RNA, as well as in the translation of RNA into proteins or enzymes, which ultimately reduces the function of the body's organs.

b. Nongenetic Theory

1) Theory of decreased immune system (auto immune theory)

Explaining that the immune system's ability to recognize itself is reduced, this can occur as a result of mutations or post-translational changes in proteins. Due to mutations, the surface antigens of cells change, as a result, the immune system identifies the altered cells as foreign and attempts to destroy them.

2) Theory of free radical damage (free radical theory)

Free radicals are formed as intermediate products in the respiration process that uses oxygen to convert fuel into ATP

(adenosine triphosphate). The instability of free radicals can inhibit cell regeneration and is considered a major factor causing damage to cell function.

### 3) Cross link theory

The increased density of collagen molecules inhibits the transport and removal of waste products from cells, thereby causing a decrease in the function of body structures.

## 2. Sociological Theory

### a. Social interaction theory

This theory explains the interdependent relationship between the abilities of a group in society and the social environment around them. In older individuals, decreased abilities often affect how they interact with their surroundings. Likewise, individuals who experience illness tend to face similar decreased abilities, which can affect the quality of their social interactions.

### b. Activity theory

This theory argues that successful seniors are those who remain active and involved in various social activities. Although their physical strength naturally decreases over time, seniors will feel satisfied if they can still carry out activities smoothly and continue to contribute to social life.

### c. Personality theory continues

This theory states that the changes experienced by elderly individuals are greatly influenced by the personality type possessed by each individual. It is emphasized that a person will continue the habits, choices, commitments, values, beliefs, and various other factors that shape his personality.

d. Liberation/withdrawal theory

This theory states that as people age, they tend to reduce their involvement in social life or withdraw from their surroundings. As a result, there is a decline in the quantity and quality of social interactions in the elderly, leading to loss of roles, barriers to social contact, and reduced commitment.

### 2.1.3 Changes That Occur in the Elderly

According to Potter & Perry (2009), the aging process causes many changes in the elderly, including:

1. Physical Changes

According to Nasrullah (2015), physical and functional changes that occur in the elderly due to the aging process include several aspects, such as:

a. Cell

Body cells, including brain cells (neurons), experience a decrease in number because the ability to regenerate cells decreases with age. The

surviving body cells tend to enlarge to compensate for the decrease in cell number, this is often seen in muscle cells and certain organs. In the brain, the number of cells also decreases, causing the loss of neurons in the brain, the impact of which is a decline in cognitive function and motor coordination. In the elderly, cellular repair processes, such as autophagy (clearing damaged cells), become less efficient, causing the accumulation of cellular damage.

b. Nervous system

Brain weight gradually decreases due to the loss of neurons and shrinkage of brain tissue (atrophy), the impact of which affects cognitive function, information processing, and the ability to adapt to change. The autonomic nervous system that regulates the response to stress (sympathetic and parasympathetic systems) also decreases and becomes less efficient. Decreased transmission of nerve signals that slow the body's response to stimuli. This makes older people often take longer to react to urgent or stressful situations, and recovery from stress is also slower.

c. Hearing system

In old age, a person will experience hearing loss, especially to high tones, is a characteristic of presbycusis. This is caused by degeneration of hair cells in the cochlea (inner ear) which play a role in capturing sound. This disorder often makes sounds unclear, and it is difficult for the elderly to understand speech, especially in noisy environments.

d. Vision system

In the aging process, the pupillary sphincter, the muscle that regulates the size of the pupil, loses its elasticity due to sclerosis (hardening of the tissue). As a result, the pupil is less responsive to bright or dim light, causing difficulty adapting to changing lighting conditions.

e. Cardiovascular system

Changes in the cardiovascular system that occur with aging are:

- a) The heart valves (especially the aorta and mitral) become thickened due to the accumulation of calcium and fibrous tissue.
- b) The aorta, the largest artery in the body, stiffens due to loss of elastin and increased collagen in the blood vessel walls. A stiff aorta increases afterload (the stress the heart faces when pumping blood), making the heart work harder.
- c) Peripheral resistance increases due to loss of arterial elasticity, so systolic blood pressure (the pressure when the heart pumps blood) tends to rise. This condition is known as isolated systolic hypertension, which is common in the elderly.

f. Respiratory system

The respiratory muscles, including the diaphragm and intercostal muscles, atrophy and lose strength with age. As a result, breathing becomes more difficult, especially during physical activity or respiratory stress (such as during an infection).

g. Digestive system

One of the physiological changes in the digestive system that occurs due to the aging process is periodontal disease (infection of the gums and bones supporting the teeth) often occurs due to lack of dental care, poor nutrition, or conditions such as diabetes. Tooth loss can reduce the ability to chew, which affects nutrient intake and overall health. Sensitivity to hunger also decreases due to changes in digestive hormones, decreased gastric motility, and the stomach's response to stretching. This causes the elderly to tend to eat less, which can lead to weight loss and malnutrition.

h. Reproductive system

In women, after menopause, estrogen levels decrease significantly, causing the vaginal walls to become thinner, less elastic, and shorter. The ovaries also shrink due to the cessation of reproductive function after menopause, resulting in decreased production of the hormones estrogen and progesterone. In men, the testicles are still able to produce sperm although they gradually decrease. Sexual drive also remains until the age of 70, as long as the health condition is well maintained.

i. Endocrine system

Growth hormones, which play a major role in the growth, maturation, maintenance, and metabolism of body organs, are produced by endocrine glands in the human body. These hormones also include sex hormones:

- a) The hormones estrogen, progesterone, and testosterone, which play a role in regulating reproduction and sexual arousal, tend to decline with age. The decline in these hormones can affect reproductive function, as well as reduce sexual arousal in aging individuals.
  - b) In addition, the production of the hormone melatonin is also reduced in the elderly; this hormone is important for improving sleep, regulating the body's biological clock, and reducing the impact of changes in sleep hours.
  - c) The pancreas gland, which is responsible for insulin production and blood sugar regulation, also experiences decreased function.
  - d) The adrenal glands, or adrenal glands, which produce adrenaline, experience a decline in activity as we age. These glands play a role in regulating hormone production in both men and women. One of the main functions of the adrenal glands is to regulate vasoconstriction of blood vessels, which ensures smooth blood flow to certain organs in the body.
  - e) The pancreas gland, in old age, the activity of this gland decreases. Likewise with the pituitary gland, where there is an increase in hormones, but in smaller amounts, including a decrease in the production of the hormones ACTH, TSH, FSH, and LH, which play a role in regulating the sleep cycle.(Sari & Halawa, nd).
- j. Integumentary system

In the aging process, the dermis loses collagen and elastin, while the subcutaneous layer loses fat tissue, causing the skin to appear wrinkled and sagging. The keratinization process also disappears, which is normal and decreased skin cell regeneration causes dead cells to accumulate on the surface. This results in the skin looking dry and less radiant.

k. Musculoskeletal system

As we age, bone mass (bone mineral density) decreases, reducing the strength of bones and making them more likely to break. Osteoporosis is a common condition, where bones become brittle due to reduced mineral density. Cartilage also decreases in function. The cartilage in joints acts as a cushion. As we age, this cartilage wears down or breaks down, leading to conditions such as osteoarthritis. This damage to the cartilage makes joints feel stiff and painful.

2. Psychosocial Changes

Psychosocial changes during the aging process will involve life transitions and losses. The longer a person lives, the more transitions and losses they will have to face. Life transitions, which are mostly caused by the experience of loss, include retirement and changes in financial circumstances, changes in roles and relationships, changes in health, functional abilities and changes in social networks.

According to Ratnawati (2017) psychosocial changes are closely related to the limitations of work productivity. Therefore, the elderly who enter retirement will experience the following losses:

- a. Financial loss (reduced income).
- b. Loss of status (position, facilities).
- c. Loss of friends/acquaintances or relations
- d. Loss of job/activity. This loss is closely related to several things as follows:
  - a) Feeling or awareness of death, changes in lifestyle (entering a nursing home, restricted mobility).
  - b) Economic capacity due to dismissal from office. The cost of living increases even though income is difficult, medical expenses increase.
  - c) The presence of chronic diseases and physical disabilities.
  - d) Loneliness arises due to isolation from the social environment.
  - e) If there is a disturbance in the five sensory nerves, blindness and difficulty occur.
  - f) Malnutrition due to loss of job.
  - g) A series of losses, namely the loss of relationships with friends and family.
  - h) Loss of physical strength and stamina (changes in self-image, changes in self-concept)

## **2.2 The Concept of Sleep**

### **2.2.1 Definition of Sleep**

Sleep is an important physiological process that allows the body and mind to rest and recover. According to Haryati (2020), sleep functions in the bio-psycho-social and cultural aspects of humans, and aims to maintain and preserve health. In addition, adequate and quality sleep plays a crucial role in maintaining a person's mental health. Research shows that there is a close relationship between sleep and mental health, where good sleep contributes to an individual's psychological well-being.

The need for sleep in the elderly is 6 - 7 hours per day (Hidayat, 2008). And the need for sleep in the elderly is around 6 hours every night, but many elderly people wake up at night and often the elderly need a long time to go back to sleep.(Hasanuddin et al., 2023).

### **2.2.2 Types of Sleep**

#### **a. NREM Sleep**

The type of sleep caused by decreased activity in the reticular activating system is called slow wave sleep because brain waves move very slowly, or is called non-rapid eye movement sleep.(Ghaddafi, 2013).

Stages of non-rapid eye movement sleep (slow wave sleep)

#### **1. Phase I**

Stage I is a transitional stage between waking and sleeping, characterized by being relaxed, still aware of the environment,

feeling sleepy, eyeballs moving from side to side, pulse and breathing rates decreasing slightly, and being able to wake up immediately during this stage which lasts for 5 minutes.

2. Phase II

Stage II is a light sleep stage and the body's processes continue to decline, with characteristics such as the eyes generally remaining still, heart rate and breathing frequency decreasing, body temperature decreasing, metabolism decreasing, it lasts short and ends in 10-15 minutes.

3. Phase III

Stage III is a sleep stage characterized by a slow pulse rate, breathing rate and other body processes, caused by the dominance of the parasympathetic nervous system and difficulty waking up.

4. Stage IV

Stage IV is a deep sleep stage characterized by decreased heart rate and breathing, range of movement and difficulty in waking up, rapid eye movement, decreased gastric secretion, and decreased muscle tone.

b. REM Sleep

REM is a sleep phase characterized by rapid eye movements, increased brain activity, and intense dreams. This phase is very important for cognitive functions such as memory consolidation,

learning, and emotional regulation. The characteristics of REM sleep are:

1. Brain activity increases similar to when awake.
2. Rapid eye movements behind closed eyelids.
3. Extreme relaxation of skeletal muscles (atonia), preventing the body from moving during dreaming.
4. The most vivid dreams usually occur during this phase.
5. REM duration increases as the sleep cycle progresses; it usually occurs about 90 minutes after falling asleep and lasts longer as the morning progresses.

### 2.2.3 Sleep Quality

Sleep quality is a person's satisfaction with sleep, so that the person does not show feelings of tiredness, easily aroused and restless, lethargic and apathetic, blackness around the eyes, swollen eyelids, red conjunctiva, sore eyes, divided attention, headaches and frequent yawning or drowsiness (Hidayat, 2006). Sleep quality includes two aspects, namely quantitative aspects which include the duration of sleep, the time needed to fall asleep, frequency of awakening and qualitative aspects which are subjective aspects of sleep depth and sleep depth (Buysse et al, 1998).

Sleep quality in the elderly tends to decline with age. This is due to various physiological and psychological changes that occur in the aging process. The elderly generally experience a decrease in the duration of nighttime sleep, an increase in the frequency of awakenings, and difficulty

returning to sleep after waking up. In addition, the quality of sleep experienced by the elderly also tends to be shallower, so they are more easily awakened by small stimuli from the environment (Crowley, 2021). Decreased melatonin hormone levels and circadian rhythm disorders are also major factors in disrupting sleep patterns in the elderly (Mander et al., 2022).

In addition to biological changes, sleep quality in the elderly is also influenced by various health conditions such as chronic pain, respiratory disorders, hypertension, and psychological disorders such as anxiety and depression (Zhou et al., 2021; Lee & Cho, 2023). Poor sleep quality in the elderly not only affects physical conditions, but also mental health and overall quality of life.

The decline in sleep quality in the elderly is caused by various interrelated factors, both physiologically, psychologically, and environmentally. As they age, the elderly experience biological changes that affect their natural sleep patterns. Here are some of the main causes of declining sleep quality in the elderly:

1. **Physiological Changes**

The aging process causes a decrease in the production of the hormone melatonin, which functions to regulate the sleep and wake cycle. In addition, the circadian rhythm also shifts, so that the elderly tend to get sleepy more quickly at night and wake up earlier. Their sleep patterns

also become shallower and are easily disturbed by sound or light (Mander et al., 2022).

## 2. Chronic Disease

Elderly people often experience chronic diseases such as hypertension, diabetes, joint pain (osteoarthritis), and heart disease. These conditions can cause discomfort during sleep and trigger sleep disorders, such as frequent waking up at night. Respiratory diseases such as sleep apnea and chronic obstructive pulmonary disease (COPD) are also common in the elderly and contribute to poor sleep quality (Zhou et al., 2021).

## 3. Psychological Disorders

Anxiety, depression, and feelings of loneliness that are common in the elderly can affect their sleep quality. These psychological disorders make it difficult for the elderly to sleep or maintain a good night's sleep (Lee & Cho, 2023).

## 4. Use of Drugs

Seniors often take various types of medications to treat chronic diseases, such as diuretics, beta blockers, antidepressants, and pain medications. Some of these medications have side effects that can interfere with sleep, such as frequent urination at night or restlessness.

## 5. Decreased Physical Activity

Low physical activity or lack of regular exercise can also cause sleep disturbances. Adequate physical activity in the morning has been shown to help improve sleep quality at night.

## 6. Lifestyle and Sleep Habits

Consuming caffeine, smoking, or drinking alcohol before bedtime can disrupt the sleep cycle. Taking long naps or irregular bedtimes also affect sleep quality (Park et al., 2022).

## 7. Environment

Environmental factors such as uncomfortable room temperature, excessive lighting, or noise around the bed can cause elderly people to have difficulty sleeping or wake up frequently (Chen et al., 2021).

### **2.3 The Pittsburgh Sleep Quality Index (PSQI)**

According to Sanningtyas (2013), Pittsburgh Sleep Quality Index (PSQI) is an assessment method in the form of a questionnaire used to measure sleep quality and sleep disorders. PSQI is widely used in research and clinical practice because it has good reliability and validity in assessing individual sleep quality, including in the elderly population.

Measuring the quality of sleep in the elderly through PSQI is done by distributing a questionnaire consisting of questions about personal data and seven main components of sleep quality. The seven components are:

#### 1. Subjective Sleep Quality

Assessment of an individual's perception of their overall sleep quality.

#### 2. Latent Sleep

The time it takes for a person to fall asleep after trying to sleep.

#### 3. Sleep Length

Duration of sleep achieved during one night.

4. Sleep Efficiency

The percentage of total sleep time to total time spent in bed.

5. Sleep Disorders

The frequency and type of disturbances that occur during sleep, such as frequent waking, nightmares, or difficulty falling back asleep.

6. Use of Sleeping Pills

Frequency of use of sleeping pills to aid sleep.

7. Daytime Dysfunction

Disturbances in daytime functioning caused by poor sleep quality, such as drowsiness, fatigue, or difficulty concentrating.

## **2.4 Elderly Fitness Gymnastics Concept**

### **2.3.1 Definition of Elderly Fitness Gymnastics**

Gymnastics is a series of systematic, organized, and well-designed movements, which can be done individually or in groups to improve body function optimally (Suroto, 2004). Gymnastics for the elderly is a series of movements specifically designed to improve their body's functional abilities, thus helping to maintain health and well-being in old age.

Elderly exercise, also called exercise for the elderly or elderly exercise, is a physical exercise program specifically designed for older people with the aim of improving their physical health and quality of life, including improving their sleep patterns. This intervention is one of the non-pharmacological approaches commonly used to improve the quality of life

of the elderly, including improving their sleep patterns.(Puzzy Handayani & Puspita Sari, 2020).

According to (Suhardo, 2004) in (Adiputra et al., 2021) elderly fitness gymnastics is a type of sport that is suitable for the elderly age group because the movements are designed to avoid jumping (low impact), jumping, crossing steps, forward and backward movements, and jerking movements. Even so, this activity is still able to improve heart and lung function with light to moderate intensity. The movements involve most of the body's muscles as a whole, are in line with daily activities, and contain elements of body weight that are balanced between the right and left sides. This exercise is also designed to improve fitness components such as cardiorespiratory capacity, muscle strength and endurance, flexibility, and maintain body composition balance.

### 2.3.2 Benefits of Elderly Fitness Gymnastics

According to(Jehaman et al., 2022)There are many benefits of fitness exercises for the elderly, namely:

1. Improving physical fitness of the elderly.
2. Reduces the risk for most common causes of death, such as diabetes, heart problems, stroke, and some cancers.
3. Helps support healthy aging, meaning that despite aging, the elderly remain fit and healthy.
4. Increase immunity and endurance of the cardiovascular system and musculoskeletal system.

5. It affects mental health so that parents feel calmer, more comfortable, and more at ease when sleeping.
6. Helps facilitate the transportation of nutrients to body tissues, which allows the secretion of melatonin and beta endorphin to be maximized and helps increase physical activity in the elderly.

### 2.3.3 Intensity of Elderly Fitness Gymnastics

Elderly exercise activities can be carried out according to the time and frequency of exercise that has been set, namely:

#### 1. Duration of training

To improve sleep quality, the elderly should do combined exercises two to three times a week for thirty minutes. (Widiastuti et al., 2020). Based on research conducted by Muhammat Ramadha Syahputra and Aisyah (2021) at the Mufakat Elderly Posyandu, Pekon Kandang Besi, West Kotaagung District, Tanggamus, Lampung, it was found that there was an effect of gymnastics done by the elderly on improving sleep quality in the elderly. Improving sleep quality in the elderly can be achieved through elderly gymnastics which are done three times a week.

Another study conducted by Revina Indria Tsani (2024) in Soborejo Village, Pringsurat District, after elderly exercise was carried out 3 times in 6 days for 15 minutes, the elderly's sleep patterns improved and experienced a decrease in insomnia levels from mild insomnia to no complaints of insomnia.

#### 2. Exercise frequency

According to KONI sports doctors, fitness exercises done two to three times a week can contribute to reducing insomnia levels in the elderly.(Riyanto et al., 2020)

## **2.5 The Effect of Elderly Fitness Gymnastics on Sleep Quality**

Healthy exercise for the elderly can improve their sleep quality by maintaining physical fitness, strengthening bones, supporting optimal heart function, and helping reduce free radicals in the body (Kurniawan et al., 2020). When the elderly do exercise, neurotransmitter production increases, so that cortical activity also increases. This condition stimulates the release of hormones such as endorphins, adrenaline, serotonin, and dopamine. These hormones come from catecholamines produced and released by the adrenal glands(de Zambotti et al., 2018).

The release of adrenaline can increase heart rate, widen the respiratory tract, and smooth blood flow to vital organs such as the heart, lungs, and brain that are actively working. This process helps optimize melatonin production, makes the body feel fitter and healthier, and supports body relaxation when waking up in the morning.(Ahorsu et al., 2020).

In addition, doing regular elderly fitness exercises has an effect on the pineal gland increasing serotonin secretion. Melatonin production depends on the availability of serotonin, and is influenced by light exposure. During the day, more serotonin is produced to support the body's activity functions, while at night, some serotonin is converted into melatonin to help sleep. at night. Melatonin and serotonin have the same molecule, but both are made from the

amino acid tryptophan. The main task of melatonin as a sleep hormone is to make people fall asleep (Myers et al., 2019).

The pituitary gland and central nervous system also produce the hormones dopamine and endorphins. When these hormones are released in optimal amounts, they can improve mood, providing feelings of pleasure and happiness. These positive effects contribute to reducing stress, which is often a contributing factor to insomnia.(Joung & Lee, 2019).

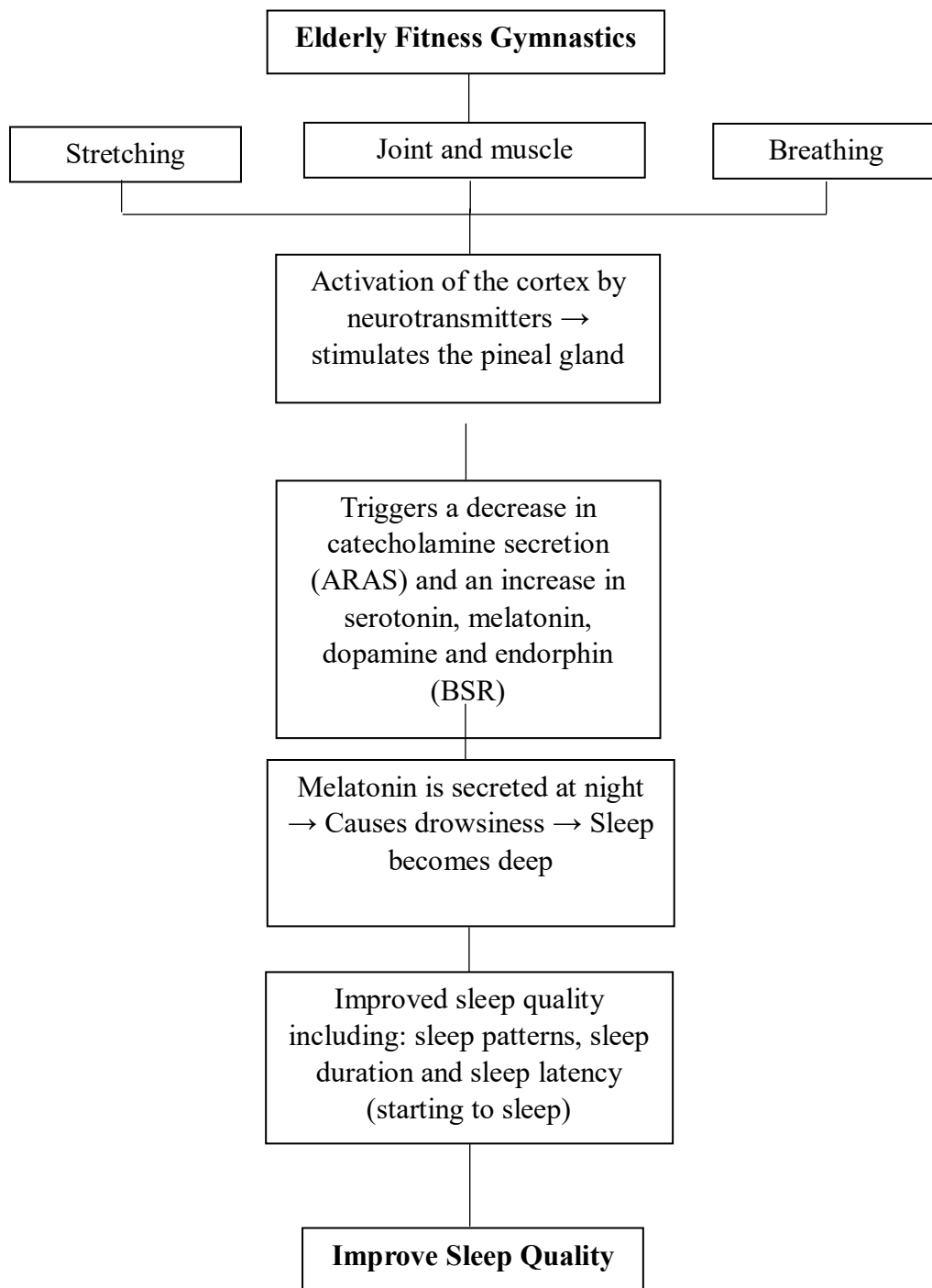
The study entitled "The Effect of Elderly Gymnastics on Sleep Quality in Elderly People with Insomnia" was conducted by Erika Dewi Noorratri and Tri Susilowati in 2022. This study used a pretest-posttest design without a control group and was conducted at the Healthy Bugar Elderly Posyandu RW 08, Sukoharjo Village. The results of the study showed that elderly gymnastics can significantly improve sleep quality in elderly people with insomnia. This is indicated by the increase in sleep quality scores after regular gymnastics intervention.

Another study entitled "The Effect of Elderly Gymnastics on the Sleep Quality of the Elderly at the Natar Lampung Panti Tresna Werdha" was conducted by a research team from STIKes Panca Bhakti Lampung in 2021. Using a pre-experimental research design and t-test, this study showed that the sleep quality of the elderly increased significantly after participating in regular elderly gymnastics activities.

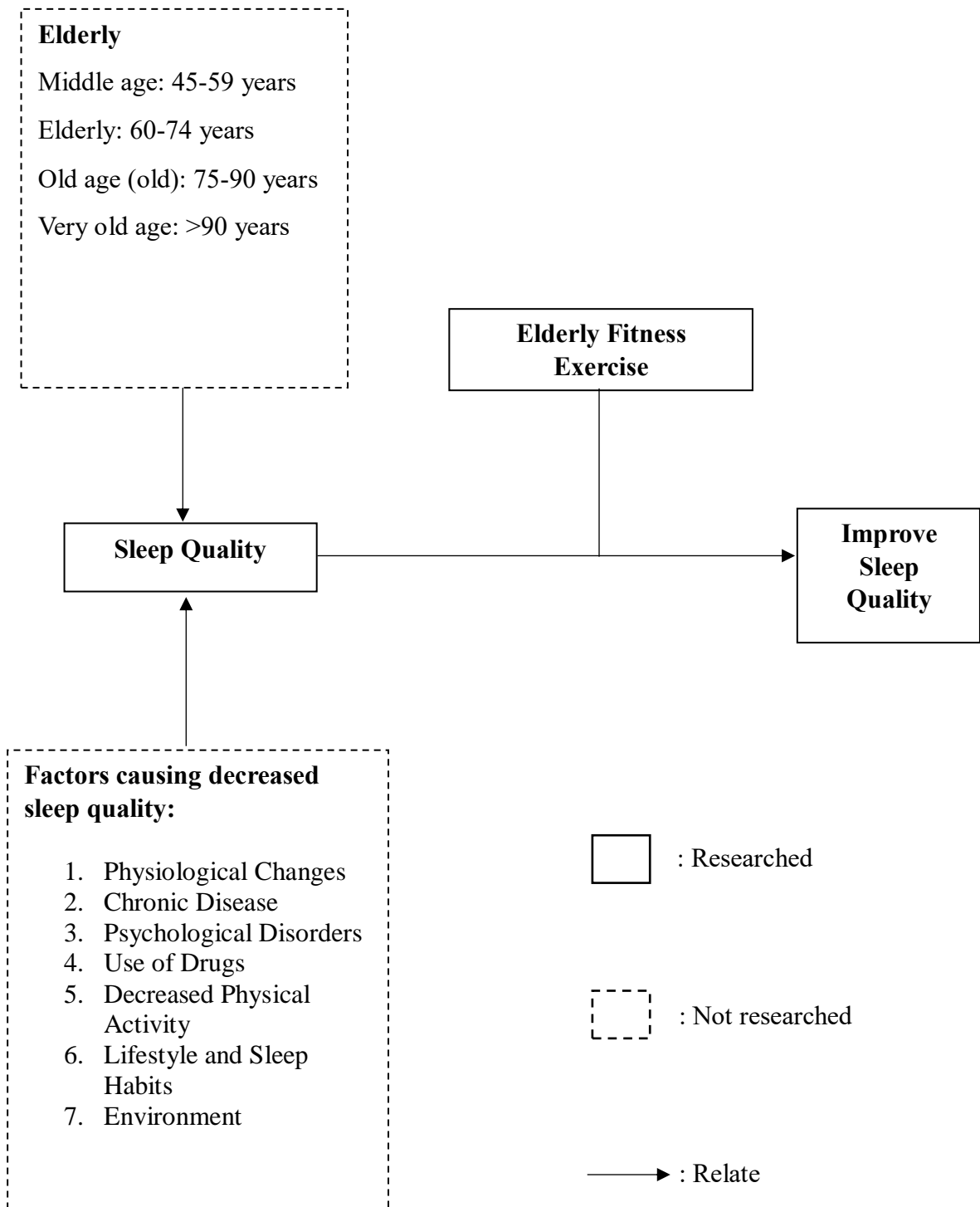
The study entitled "The Effect of Elderly Fitness Gymnastics (Ergonomic) on Sleep Quality" conducted at the Budi Mulia 02 Tresna Werdha

Social Home, showed that ergonomic elderly fitness gymnastics is effective in improving the quality of sleep of the elderly. This study used a one-group pretest-posttest design and showed an improvement in sleep quality after regular ergonomic elderly gymnastics.

The effect of elderly fitness exercises on sleep quality is illustrated in the diagram below:



## 2.6 Research Concept Framework



## 2.7 Hypothesis

The hypothesis that will be used in this research is:

1.  $H_0$  = there is no difference in the quality of sleep of the elderly before and after the implementation of elderly fitness exercises.
2.  $H_1$  = there is a difference in the quality of sleep of the elderly before and after implementing elderly fitness exercises