



# Innovative Approaches: Massage Therapy And Exercise To Reduce Fatigue And Stress

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**Abstract.** The aim of this study is to develop an effective massage and exercise therapy model to alleviate fatigue and stress in final semester students. Employing a Research and Development design with the 4D model (Define, Design, Develop, Dissemination), the study begins with field surveys and literature reviews to assess needs and recommend appropriate therapies. The Design phase emphasizes light to moderate aerobic activities, breathing techniques, body relaxation, and self-massage. During the Develop phase, the model undergoes validation by experts and feasibility testing on small (n=5) and large scales (n=8), followed by an effectiveness test. Validation and feasibility are assessed through questionnaires and observation guides to ensure the model's appropriateness, safety, and comfort. The effectiveness test, involving 50 subjects (25 each for fatigue and stress variables), employs a paired t-test with purposive sampling. Fatigue is measured using the Multidimensional Fatigue Inventory (MFI) and stress using the Perceived Stress Scale (PSS). Results indicate high expert validation rates (0.75-0.79) and feasibility scores (81%-84%). The paired t-test confirms significant reductions in fatigue and stress ( $p < 0.05$ ). The final model, effective in reducing fatigue and stress, includes 20 minutes of walking with breathing techniques and running, followed by 20 minutes of self-massage on various body parts, totaling approximately 40 minutes. The developed model is thus validated as suitable and effective for final semester students, and its findings are disseminated to the public.

**Keywords:** exercise therapy, massage therapy, fatigue, stress

## 1 Introduction

Stress and fatigue are two common mental health issues in modern life. Stress can affect various aspects of physical and mental health, such as increasing the risk of diseases and sleep disorders [1]. Stress triggers a response in the body through the autonomic nervous system and the hypothalamus-pituitary axis to activate various parts of the brain using chemical messengers such as dopamine, serotonin, and others [2]. Increased plasma cortisol levels caused by stress affect energy intake, absorption, and utilization, including protein turnover and modulation of protective protein expression, all leading to a decrease in energy available for muscle growth. Cortisol also regulates muscle growth regulators, including growth factors and transcription factors, causing growth

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suppression [3]. Fatigue is caused by two main factors: the drive to sleep and the body's rhythms that regulate sleepiness [4]. Depression, anxiety, and fatigue can exacerbate the impact of pain on health-related quality of life; these three factors can influence each other and further worsen their adverse effects on various aspects of health-related quality of life [5].

Stress and fatigue can affect an individual's physical and mental health, as well as their performance and productivity. The use of medications to address stress and fatigue is common, but some people experience unwanted side effects. Non-pharmacological methods such as massage therapy and exercise therapy can be effective and safe alternatives in reducing stress and fatigue levels. Exercise therapy can improve physical health, body image, coping strategies with patient stress, quality of life, and independence in performing daily activities in the elderly population [6].

Previous research has shown that massage therapy and exercise therapy separately can help reduce stress and fatigue levels. However, there is still limited research exploring the effectiveness of combining the two as a non-pharmacological method. It is recommended to perform intensive care using massage as a harmless method to reduce stress, improve mental health, and prevent a decline in quality of life [7]. This systematic review and meta-analysis show that massage therapy can reduce pain intensity and anxiety in burn patients. Therefore, health managers and policymakers are advised to pay special attention to massage therapy as a simple, inexpensive, and effective non-pharmacological treatment to reduce pain and anxiety in burn patients [8]. Massage therapy can reduce postoperative pain [9].

Therefore, this study will develop a combination model of massage therapy and exercise therapy as an effective alternative in reducing stress and fatigue levels. It is hoped that this study can contribute to the development of non-pharmacological methods in addressing mental health issues and improving the quality of life of individuals. This review shows that massage has significant benefits in various conditions, such as prenatal depression, autism, arthritis, and more. Massage therapy can have positive effects by stimulating pressure receptors, increasing vagal activity, and reducing cortisol levels. Although there are still shortcomings in research, massage therapy is becoming increasingly popular and widely practiced in traditional medical settings, necessitating more rigorous research [10].

Based on the results of this study, it can be concluded that the model of massage therapy and exercise therapy can be an effective non-pharmacological method to reduce fatigue and stress. Therefore, it is recommended to pay more attention to the importance of performing massage and exercise therapy in efforts to improve health and quality of life. This study focuses only on: 1) the implementation of a model of massage therapy and exercise therapy to reduce fatigue and stress, 2) trial of the implementation model of massage therapy and exercise therapy designed, 3) evaluating the effectiveness and efficacy of the implementation model of massage therapy and exercise therapy, 4) increasing understanding and knowledge about massage therapy and exercise therapy techniques as alternative methods to improve physical and mental health. This study aims to answer: 1) how to design an implementation model of massage therapy and

exercise therapy? 2) how to conduct trials of the massage therapy and exercise therapy model? 3) how to evaluate the effectiveness and efficacy of the massage therapy and exercise therapy implementation model?

## 2 Method

The method used in this research is Research and Development (R&D). This study is designed using the 4D development model. The 4D development model follows the flow from [11], which includes four stages: define, design, develop, and dissemination.

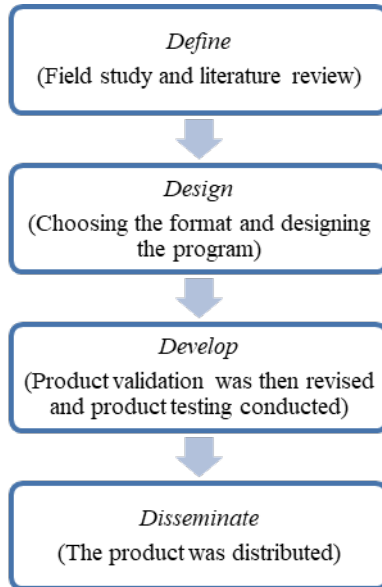


Fig 1. 4D research framework

The research was conducted at the Faculty of Sports and Health Sciences, Yogyakarta State University. The research period started in April 2023 and ended in September 2023. The population in this study consists of 80 senior students majoring in Sports Science at the Faculty of Sports and Health Sciences, Yogyakarta State University, from semesters 6 and 7. The sample size was calculated assuming an effect size of 0.8, 80% power, two-tailed test, and a significance level of 0.05, resulting in 52 participants, rounded to 50 individuals.

Effect Size Calculation	Statistics Test	Small Effect	Medium Effect	Large Effect
Phi or Cramer's Phi	Chi Squared	0.1	0.3	0.5
Cohen's d	t-Test (Paired & Independent)	0.2	0.5	0.8
Eta Squared	ANOVA	0.01	0.06	0.14
r	Correlation	0.1	0.3	0.5
r <sup>2</sup>	Correlation and t-Test (Independent)	0.01	0.09	0.25

**Fig 2.** Statistical power analysis (12)

In the study, massage was conducted using the Self-Massage technique. Sitting positions included: calf (front upper thigh). The position of the sitting leg is straightened (forearm and upper arm, shoulder). Sitting position leg straightened (neck and forehead). Exercise therapy in this study was conducted with the intermittent model: 1) preparation, 2) first 100 meters walk, 3) second 100 meters run, 4) third 100 meters walk, 5) fourth 100 meters run. The Multidimensional Fatigue Inventory (MFI) questionnaire was the evaluation tool used to measure and analyze the fatigue experience of individuals. MFI is designed to provide a deeper understanding of various aspects of fatigue that may be experienced by an individual, both physically, mentally, and emotionally. This questionnaire consists of a series of statements covering five main dimensions of fatigue: General: measures overall fatigue experienced. Mental: measures the level of mental or cognitive fatigue. Physical: measures the level of physical fatigue. Emotional: measures the level of emotional or psychological fatigue. Motivation: measures the level of disruption in motivation and energy to perform activities. The Perceived Stress Scale (PSS) questionnaire is a measurement tool used to assess the level of stress perceived by individuals in their daily life situations. This questionnaire includes several statements asking how often a person feels stressed or unable to cope with the demands of their life within a specific timeframe.

The data analysis technique for content validity testing uses Aiken's formula ([13]. Reliability testing in this study employs the inter-rater reliability method, also known as Intraclass Correlation Coefficients (ICC). In the process of evaluating the feasibility of the massage therapy and exercise therapy model, a rating scale measurement was used to collect raw data in numerical form.

**Table 1.** Interpretation scale with rating scale

Percentage score (%)	Interpretation
75 < score ≤ 100	Suitable
50 < score ≤ 75	Firly Suitable
25 < score ≤ 50	Less Suitable
0 ≤ score ≤ 25	Not Suitable

Mathematically, according to Sugiyono (2016: 95), it can be expressed with the following equation:

$$\frac{\sum \text{score obtained by the researcher}}{\sum \text{ideal score all of item}} \times 100\%$$

**Table 2.** Summary of Data Analysis Techniques

Development Stage	Activity	Data Source	Data Analysis Technique	Result
Define	Needs Analysis	Field study and literature review	Qualitative descriptive	Types of treatment to reduce fatigue and stress Draft model
Design	Model design based on define results	FGD based on define recommendations	Model arrangement according to needs	
Develop	Model development	Expert assessment and input	Aiken's V	Revised draft model for feasibility testing
Feasibility test (small and large scale)	Research subjects	Quantitative descriptive	Revised draft model for effectiveness testing	
Effectiveness test	Pretest and posttest results	Paired t-test	Effectiveness test results	
Dissemination	Distribution of guidebooks and journal publication	Journal (Submitted)		Guidebook and journal article

### 3 Result

#### 3.1 Define Stage

In the Define stage, needs analysis is conducted through field studies and literature review. The results of an unstructured field survey conducted with 52 final-year students are as follows:

**Table 3.** Needs analysis from field study findings

Problem Identification	Needs	Source of Information
Academic pressure	Solutions to reduce high academic pressure Effective time management strategies	Field study Literature review
Psychological stress	Strategies to manage psychological stress Relaxation techniques	Field study Literature

Physical and mental fatigue	Ways to address physical and mental fatigue	review Field study
	Regular and balanced exercise	Literature review
	Regular sleep patterns	Literature review
Impact on quality of life	Improve daily quality of life	Field study
	Enhance stress management skills	Literature review

**Table 4.** Grid of Types of Massage Therapy and Exercise Therapy

Types of Fatigue/Str ess	Perceived Complaints	Basic Principles of Massage Therapy	Types of Massage Therapy	Basic Principles of Exercise Therapy	Types of Exercise Therapy
Academic Fatigue	Academic stress	Reduce muscle tension	Relaxation Massage	Increase relaxation	Yoga
Exam Stress	Exam anxiety	Reduce anxiety	Aromatherap y Massage	Reduce stress	Jogging, Walking
Mental Fatigue	Feeling overwhelmed	Increase relaxation	Self-massage, Head Massage	Improve concentration	Meditation
Physical Fatigue	Lack of sleep	Improve blood circulation	Deep Tissue Massage	Increase energy	Yoga

### 3.2 Design Stage

Development of the exercise model with reference to the results of field surveys and literature reviews has been completed.

**Table 5.** Therapeutic Exercise Model

Type	Intensity	Repetitions/Time
Walking with breathing exercise	Light-moderate	5 minutes
Running	Light-moderate	5 minutes
Walking with breathing exercise	Light-moderate	5 minutes
Running	Light-moderate	5 minutes
Total		20 minutes

**Table 6.** Massage Therapy Model

Type	Intensity	Repetitions/Time
Massage on calf (right/left)	Light-moderate	2 minutes
Massage on upper thigh (right/left)	Light-moderate	2 minutes

Massage on inner arm (right)	Light-moderate	2 minutes
Massage on inner arm (left)	Light-moderate	2 minutes
Massage on outer arm (right)	Light-moderate	2 minutes
Massage on outer arm (left)	Light-moderate	2 minutes
Massage on shoulder (right)	Light-moderate	2 minutes
Massage on shoulder (left)	Light-moderate	2 minutes
Massage on back of neck (right/left)	Light-moderate	2 minutes
Massage on forehead (right)	Light-moderate	2 minutes
Total		20 minutes

### 3.3 Develop Stage

Validation of the product is conducted involving experts with relevant knowledge in the field of the developed product, as well as students who have experienced fatigue and stress. Expert validation involves 6 content experts (3 massage experts and 3 sports experts) and 3 media experts.

**Table 7.** Results of content expert validation

Aspect	Score Obtained	Maximum Score	Percentage (%)	Category
Material Suitability	156	192	81	Acceptable
Content Suitability	222	264	84	Acceptable
Language Suitability	120	144	83	Acceptable

Based on the assessment by experts (n=6), the scores obtained are as follows: For the content aspect, a score of 156 out of a maximum score of 192 was obtained, resulting in 81%, categorized as "Valid" (according to the interpretation scale in Table 1). For the comprehensiveness aspect, a score of 222 out of a maximum score of 264 was obtained, resulting in 84%, categorized as "Valid" (according to the interpretation scale in Table 1). For the language appropriateness aspect, a score of 120 out of a maximum score of 144 was obtained, resulting in 83%, categorized as "Valid" (according to the interpretation scale in Table 1).

**Table 8.** Results of media expert validation

Aspect	Score Obtained	Maximum Score	Percentage (%)	Category
Size	19	24	79	Acceptable
Cover Design	55	75	76	Acceptable
Language Suitability	113	144	78	Acceptable

Based on the assessment results from experts (n=3), it was found that for the material feasibility aspect, a score of 19 out of a maximum score of 24 was obtained, resulting in 79%, categorized as adequate (according to the interpretation scale in Table 8). For the content validity aspect, a score of 55 out of a maximum score of 75 was obtained, resulting in 76%, categorized as adequate (according to the interpretation scale in Table 8). Meanwhile, for the language feasibility aspect, a score of 133 out of a maximum

score of 144 was obtained, resulting in 78%, categorized as adequate (according to the interpretation scale in Table 8)

**Table 9.** Results of Aiken’s V Index validity test

Aspect	V per Aspect	Category
Content Aspect	0.775	Valid
Procedure Aspect	0.791	Valid
Language Aspect	0.76	Valid

Based on the validity test results in Table 9, it is found that out of 6 validators, a total of 6 content experts and 3 media experts, the content aspect obtained a V score of 0.775 (valid), the procedure aspect obtained a V score of 0.791 (valid), and the language aspect obtained a V score of 0.76 (valid). Based on the calculation of the total of 27 items, where all items have an Aiken's V Index greater than the V table (>0.750), it can be interpreted that all items are considered valid.

The reliability test is to assess the level of agreement among experts or raters on the model of sports therapy and exercise therapy for fatigue and stress.

**Table 10.** The results of the intraclass correlation reliability test

	Intraclass Correlation	Sig
Single Measures	0,841 <sup>a</sup>	.000
Average Measures	0,914 <sup>c</sup>	.000

**Table 11.** Categorization of reliability

Score	Category
> 0,80	Excellent agreement
0,61 - 0,80	Good agreement
0,41 - 0,60	Moderate agreement
< 0,40	Poor agreement

Based on Table 10, the average measure is 0.914. Referring to Table 11 for reliability categorization, where 0.914 > 0.80 indicates excellent agreement. It can be concluded that the agreement among raters is very strong, and each rater has fairly good consistency.

### 3.4 Feasibility Assessment

Small-scale feasibility testing in this study used user feasibility assessment criteria, involving 5 final-semester students (n=5). The treatment model consists of walking, jogging, breathing exercises, and self-massage. The results of the small-scale feasibility test are presented in the following table:



**Table 12.** Results of small-scale feasibility testing

Aspect	Subject Evaluation					Score Total	%	Category
	1	2	3	4	5			
Content	38	35	41	37	39	190	86%	Valid
Procedure	40	38	41	38	44	201	84%	Valid
Language	13	14	14	13	13	67	71%	Valid

The massage therapy and exercise therapy model for reducing fatigue and stress was accepted by the sample with a percentage of 100%, content 86%, procedures 84%, and language 71%, and was fully followed through to completion by the sample.

**Table 13.** Results of large-scale feasibility testing

Aspect	Subject Evaluation								Score Total	%	Category
	1	2	3	4	5	6	7	8			
Content	3	3	3	3	4	41	40	40	190	86%	Valid
	8	7	8	8	2						
Procedure	4	3	4	4	4	41	42	37	201	84%	Valid
	0	9	1	2	3						
Language	1	1	1	1	1	12	15	12	67	71%	Valid
	3	4	4	2	3						

The massage therapy and exercise therapy model for reducing fatigue and stress was accepted by the sample with a percentage of 100%, content at 89%, procedure at 85%, and language at 82%, and was followed through to completion by 100% of the sample.

**3.5 Results of Product Effectiveness Test**

The effectiveness test of the model was conducted on 25 individuals to assess fatigue levels and 25 individuals to assess stress levels. The results of the treatment are as follows:

**Table 14.** Normality test

Variable	Test	Sig.	Intepretation
Fatigue	Pretest	0.850	Normal
	Posttest	0.886	Normal
Stress	Pretest	0.088	Normal
	Posttest	0.530	Normal

Based on table 14 above, it is known that the normality test for the fatigue variable before treatment (pretest) is 0.850 and after treatment (posttest) is 0.886, while for the

stress variable before (pretest) it is 0.088 and after treatment (posttest) is 0.530. The overall results of the normality test show that  $\text{sig.} > 0.05$ , indicating that the data are normally distributed.

**Table 15.** Paired t-test

Variable	Test	t	Sig. (2-tailed)
Fatigue (MFI)	Pretest - Posttest	4.194	0.000
Stress (PSS)	Pretest - Posttest	10.140	0.000

From the calculation of the difference test after applying the developed model, the results obtained for fatigue measurement yielded a significance of 0.000, and for stress measurement, the significance obtained was 0.000.

## 4 Discussion

Results of the study conducted on 25 students ( $n=25$ ) with pre-treatment and post-treatment measurements of stress levels showed a very significant value of 0.000 ( $\text{sig.} < 0.05$ ), as indicated in Table 15. The measurements were performed using the Perceived Stress Scale (PSS) questionnaire. This study demonstrates that the combination of massage therapy and exercise significantly reduces stress levels in students. This finding is consistent with other research indicating that stress management techniques can include strategies that enhance cognitive and emotional functions, such as breathing meditation, body scan techniques, and gentle physical exercises inspired by yoga [14]. Other studies also explain that practicing yoga and meditation at least once a week can reduce stress and anxiety in students [15].

Stress is an individual's response to pressure or burden from external situations or events, and responses to stress can be influenced by individual psychological characteristics [16]. Stress can disrupt the balance in neural circuits that regulate thoughts, decision-making, anxiety, and mood, which in turn can affect behavioral expressions and conditions [17]. Academic stress is common among students. Academic stress is defined as daily stress in students that impacts their psychological and physiological well-being. For instance, exams are considered one of the most acute stress experiences for students [18]. Exam periods cause a temporary increase in stress perception and mental pressure [19].

Stress can trigger the release of stress hormones such as cortisol, which increases heart rate and blood pressure and mobilizes the body's resources. Heart rate is a key indicator of changes in an individual's physical and emotional condition [20]. When a person experiences psychological stress, the body's ability to produce antibodies in response to a vaccine is impaired or diminished. Consequently, the body becomes more susceptible to infections due to the lack of protection generated by the immune system through vaccination [21]. When stress continues, it can lead to mental disorders or depression. Common symptoms of depression include physical fatigue, reduced appetite, insomnia, movement disorders, and even suicidal thoughts [22].

Research results show that the prevalence of insomnia among students is much higher than in the general population [23]. Students often experience sleep disturbances and feel more tired, especially during exam periods [24]. Students who have problems with sleep quality or insomnia tend to be associated with increased stress [25]. Physical activity can be a non-pharmacological therapy that can improve sleep by helping individuals cope with stress [26]. Insomnia among students can negatively impact their academic performance [27].

Additionally, this study also tested the fatigue variable. The results of the study conducted on 25 students (n=25) with pre-treatment and post-treatment measurements of fatigue levels showed a very significant value of 0.000 (sig. < 0.05), as indicated in Table 15. The measurements were performed using the Multidimensional Fatigue Inventory (MFI) questionnaire. This study demonstrates that the combination of massage therapy and exercise significantly reduces fatigue levels in students.

Research findings explain that fatigue and feelings of exhaustion can arise as a response to prolonged pressure. Besides psychological factors, there are biological aspects in the body that can play a role in fatigue, such as disturbances in the nervous system, neurohormonal system, or immune system, although there are no definitive indicators to measure the level of fatigue. When someone experiences psychological problems caused by stress, such as post-traumatic stress disorder or depression, fatigue often becomes one of the main symptoms [28]. Moreover, fatigue is a universal symptom reported by individuals in the general population as well as by those suffering from various medical and psychological conditions, including cancer, multiple sclerosis, chronic fatigue syndrome, depression, and anxiety. Prolonged fatigue can have significant economic consequences for society [29].

Study findings indicate that in adolescents experiencing chronic pain, fatigue impacts daily functions such as perceived pain levels, mobility, and learning performance [30]. Research on students in China explains that fatigue is common and that exercise might be a simple way to improve sleep and reduce fatigue [31]. More specifically, Rosenthal et al., (2008) explained that treatment for all types of fatigue should include a structured plan for regular physical activity consisting of stretching and aerobic exercise, such as walking.

Patients with chronic fatigue syndrome generally benefit from and experience reduced fatigue after undergoing exercise therapy, with no evidence showing that exercise therapy can worsen the treatment outcomes. There are positive impacts on sleep quality, physical function, and self-perceived general health [33]. Various interventions have been used in the treatment and management of chronic fatigue syndrome. Interventions showing promising results include cognitive behavioral therapy and graded exercise therapy [34].

## 5 Conclusion

The developed model of massage therapy and exercise therapy consists of walking with breath exercises for 100 meters, running for 100 meters, walking with breath exercises for 100 meters, and running for 100 meters, with a total duration of approximately 20 minutes. This is followed by self-massage on the calves, front of the upper thighs, forearms, upper arms, shoulders, neck, and forehead for approximately 20 minutes. The total time for the developed method is around 40 minutes. The model has been validated by experts and is deemed suitable for use as a therapy model to reduce fatigue and stress. The massage and exercise therapy model is effective in reducing fatigue and stress in final semester students.

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