

**Wox7001 research methodology**

**2/2021/2022**

**RESEARCH TOPIC**

**<** **WEATHER TIME-RESTRICTED EATING IS SUITABLE FOR All AGES>**

**individual assignment 4**

**RESEARCH PROPOSAL**

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# Abstract

The number of patients with metabolic syndrome increases with age. Scientists have found that the regulation of biological species can affect the development of metabolic syndrome. The method of time-restricted eating was discovered and admired. In fact, time-restricted eating combats the threat of metabolic syndrome by adjusting people's physical eating activity throughout the day. This approach appears to improve short-term measures of metabolic health. However, whether the long-term maintenance of time-restricted eating is really suitable for people of all ages is a topic that must be studied. For example, in childhood, whether the use of time-restricted eating will affect its body growth and development. In the adult stage, due to the instability of people's daily behavior and rhythm, especially for some workers who stay up late, will the implementation of time-restricted eating affect their mental health and work efficiency? For older adults, whether they have the ability to fully understand the concept of TRE. In fact, a misunderstanding of the TRE scheme is likely to have the exact opposite effect as expected. TRE trial data from at least 50 articles would have been collected, aggregated, cleaned and analyzed. In-depth research will be conducted on whether people of different age groups are suitable for TRE.

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# Introduction

## Background

With the improvement of people's quality of life, obesity has become a serious trend year by year. Obesity is often accompanied by physical abnormalities such as increased blood pressure, impaired glucose tolerance, and dyslipidemia or collectively referred to as metabolic syndrome. Research has linked MS to poor eating habits. Such as under- or over-eating, irregular diet, high-calorie western food, sedentary lifestyle, chronic insomnia, etc. (Cross et al., 2021)

Research by Phillips and his team in 2021 shows that MS is also closely related to the human body clock (CC). (Phillips et al., 2021) Therefore, some medical experts have proposed a method to reduce the effects of PEH and CC. They suggest that people can adjust their body's metabolism by adjusting their mealtimes. By adjusting meal times, people can delay and reduce their risk of developing MS. They call this approach time-restricted eating (TRE).

TRE refers to methods that restore circadian rhythms and improve metabolic mechanisms by shortening the time people eat each day and not restricting the types of foods people eat. That is, extending the daily fasting time. (Światkiewicz et al., 2021) For example, people delayed breakfast by 2 hours and dinner time by 2 hours after TRE intervention. The TRE window is defined as the time interval during which 95% of calorie intake events occur during the day. (Wilkinson et al., 2020) Shortening the TRE window allowed participants to have more than 12 hours of metabolic dormancy in their daily lives.

In fact, clinical trials have shown that TRE has a significant ameliorating effect on MS disease. However, some experts have raised some controversies that TRE may face. First, most current TRE clinical trials are conducted on adults aged 18-60 whose bodies are already facing problems with MS disease. This makes some of the effects of TRE in the prevention of MS theoretical and difficult to prove. Secondly, underage children are in the period of growth and development and need to supplement nutrition to promote growth and development. If TRE is used to control underage children, will it affect their growth and development? In addition, will the use of TRE cause the elderly to suffer from orthopedic diseases such as calcium deficiency? (Lobene et al., 2021) Finally, physique varies from person to person and may be greatly affected by age. Therefore, different age groups need to participate in different ways of managing TRE time. (Schuppelius et al., 2021)

## Problem statement

The age of patients with obesity, diabetes, cardiovascular disease, etc. is getting younger by the improvement of the quality of human life. (Gabel et al., 2021) Time-restricted eating (TRE) has been researched and there is evidence that it is one of the effective ways to prevent and improve these health problems. (Stabouli et al., 2021) The effects of TRE usage may vary for different age groups. There may even be negative effects on certain ages of people.(Schuppelius et al., 2021)

## Objective

The purpose of this research is to investigate the TRE health effects in 3 ages of group of people [children (0-18), adults (18-55), elderly (55+)] among at least 50 quantitative trail journals of the selected health parameter data at January of 2023 within half year.

## Research questions

1. What effect does TRE have on the intelligence of different age groups?
2. What impact does TRE have on children's growth and development?
3. What potential hidden dangers does TRE cause to people of all ages?
4. How to find out whether various parameters are directly related to TRE?
5. What impact does TRE have on children's psychology?
6. What impact does TRE have on adult work productivity?
7. What effect does TRE have on bone mass in the elderly?
8. How is the execution of TRE in the elderly accurately implemented?

## Expected outcome

The final delivery will include statistics health parameters on four different age groups of participants, such as participants' weight, blood pressure, and blood sugar data, periodic intelligence test reports, mental health test. A summary of adverse reaction feedback and comparative statistical analysis for different ages of participants.

## Motivation

Obesity, diabetes, and cardiovascular diseases are getting younger today. The TRE method has been studied to effectively prevent these chronic diseases. (Światkiewicz et al., 2021)The motivation for this study is first to further confirm whether TRE is suitable for a comprehensive rollout across all ages of people. Second is to help people prevent chronic diseases such as obesity, diabetes, and cardiovascular diseases through health science method as much as possible. Lastly, the comprehensive promotion of TRE may reduce the burden of long-term drug control of diabetes and cardiovascular diseases on the kidneys of patients, and prolong the overall life expectancy of human beings.

## Research significant

This study was designed to investigate whether TRE has no side effects in people of all ages. The contribution of this study is in two parts, the first is to explore the age group in which the effect of the TRE method is most pronounced. Because TRE is an improvement in routine and resting habits, his results need to be followed by theoretical support for the suitability of strict TRE implementation in children and the elderly.

## Research schedule

# Literature Review

## Intended proposed research

All things have two sides. TRE is no exception. The primary goal of this study will be to explore the direct and indirect effects of long-term TRE in different age groups. The effects are both positive and negative. The researchers will organize and summarize 50 experimental data of quantitative research on TRE in the past five years through qualitative research. Quantitative research articles will use journal type literature from the web of science. These data will be statistically stored in Excel. Researchers will use Python to perform data cleaning, data analysis, data visualization, EDA, modeling, and forecasting on the dataset. Among them, the data wrangling and cleaning phase can take a lot of time. The direct and indirect effects of TRE may be discovered during the EDA and predictive analysis stages. Ultimately, researchers will express their views on the impact of TRE on participants of different ages based on the results of the study.

## Prior research

Time-restricted eating (TRF) and time-restricted eating (TRE) have been studied for a long time. Twenty of these articles were selected for this review and they can be classified according to short-term impact, impact of chronic disease, and feasibility.

**Short-term disease impact**

Stabouli and his group did TRE intervention quantitative research among children and adolescents in 2021. It was confirmed that TRE could control and prevent eating disorders and obesity in this population. They found that the prevalence of eating disorders was very high among the obese child subjects. Among these treatment methods, some are high economic pressure and some may have the hidden danger. As their main view, tailor-made TRE intervention strategies for patients are more economic, health and security. (Stabouli et al., 2021)

Lobene and his group investigated the effects of 12-week TRE on bone mineral density and bone turnover in obese adults aged 18-65 years by using quantitative research. Their experiments used an 8-hour TRE window and non-TRE as usual to compare bone parameters. The results suggested that a short-term TRE intervention with an 8-hour eating window did not adversely affect obese adults. However, they believe that clinical changes in BMD assessed by the official authoritative channel DXA require at least 1-2 years to be based data. Also, the target population their study cited could not show whether TRE blocks bone development in children and if TRE causes osteoporosis in the elderly. In addition, the menopausal status of older women also has an impact on bone status. Due to the small sample of older women in their study, the recommendation requires further clinical data. Finally, they propose that exercise can attenuate bone loss in humans caused by changes in diet quality. Their TRE clinical data did not exclude external interference from these two factors. Therefore, they thought that further studies were needed to corroborate the long-term (1-2 years) effect of TRE on bone loss. (Lobene et al., 2021)

Currenti and his group did research on the effects of TRF on the brain health of people over the age of 50, such as Alzheimer's disease. They calculated the average daily time window based on the dietary characteristics and frequency of more than 800 elderly Italians. After ruling out some potential additional factors affecting them, it was found that the probability of cognitive impairment in the elderly who adhered to TRF was greatly reduced. However, they believe that TRF has the following two limitations. Firstly, TRF affected the eating habits of the elderly with cognitive impairment. Some populations with lower education levels might have difficulty in properly implementing TRF due to lack of health awareness, thereby affecting the accuracy of the experiment. In addition, the effects of TRF on regional brain volume, cerebrospinal fluid, and neural network activity still required extensive human experiments to demonstrate. (Currenti et al., 2021)

Mattson and his group made some qualitative research on the effects of intermittent fasting (IF) of people. Firstly, for sedentary people, overeating during the open TRF window may cause metabolic diseases. Secondly, the populations of IF may face issues with little capacity intake for longer periods of time. However, IF may have positive effects on diabetes, cardiovascular disease, cancer, Alzheimer's disease, Parkinson's disease and stroke. In addition, IF, PF, TRF have been shown to be effective in weight loss. It improves mitochondrial health, DNA repair, autophagy, metabolism while improving health indicators. Finally, they proposed that IF might have efficacy in improving general health and fighting aging diseases. (Mattson et al., 2017)

Chawla and his group investigated the negative effects of traditional TRE patterns and Ramadan fasting (RF) patterns on two circadian parameters (cortisol and melatonin). The results showed that the RF pattern cortisol circadian rhythm was weakened, and melatonin was also less. This means that the target population will get worse sleep time and sleep quality. However, there are few papers in TRE research that study the effects of these two parameters on the human body. In addition, they suggest that TRE may have effects on women with PCOS and pregnant women, so for the female experimental population, pregnancy-related, pathological and physiological effects should be considered. Third, since light, energy consumption, and sleep time all affect the accuracy of serum parameters, they feel that these factors need to be taken into account in evaluating TRE performance. Finally, they concluded that a TRE regimen that skipped breakfast would have a different effect on circadian rhythms than a TRE regimen that skipped dinner.(Chawla et al., 2021)

Manoogian and his group published a study examining the relationship among circadian rhythms, TRF and aging characteristics. They advocated improving physical health by adjusting circadian rhythms to coordinate cells, tissues, and behavior. These impacts diminish with human age grows. TRF was a coordinated approach that can affect the robustness of circadian rhythms. They believed that irregular eating patterns could disrupt the body's metabolism and lead to chronic diseases. Maintenance of TRF intervention without altering nutritional quality and quantity could reverse chronic disease. Thus, their study suggested that maintaining TRF could prevent and treat chronic diseases by stabilizing the circadian clock. (Manoogian & Panda, 2017)

Jamshed and his group conducted a 4-day experiment with 11 overweight adults aged 20-45 years using a randomized crossover method. After comparing and calculating the experimental results, it was found that the blood glucose, cardiometabolic risk factors, hormones and gene expression of whole blood cells was significantly affected in patients who took eTRF to interfere with the eating window time. The results showed that eTRF improved multiple aspects of health. Firstly, improve insulin conduction by reducing the average daily blood sugar and reducing fluctuations to achieve the purpose of blood sugar control. Secondly, this approach improved the circadian patterns of fasting cholesterol, ketones, cortisol, and clock genes. Finally, some research data suggest that eTRF can assist in improving cardiometabolic health, with anti-aging potential. However, they also suggested that further studies are needed to corroborate these results due to the limitations of the target population. (Jamshed et al., 2019)

**Chronic disease impact**

Different to short-term effects on the human bodies, the next category focuses on chronic diseases.

Christensen and Kirkham conducted research on the effectiveness of TRE in breast cancer (BC) and cardiovascular disease (CVD). Evidence shows that TRE has positive effects on metabolic, cardiovascular and cancer-specific health. Furthermore, they describe the safety and feasibility of implementing TRE in such patients. They mention that short-term fasting has become a practice in Judaism and Islam. Such as fasting, Yom Kippur, etc. A large amount of practical evidence proves that short-term implementation of TRE is a safe method for human health. Therefore, they recommend TRE as a method for the prevention and adjunctive treatment of BC and CVD diseases. (Christensen & Kirkham, 2021)

Gabel and his group conducted a research review on the effect of TRE on body weight and cardiovascular disease risk factors in 2021. Findings showed that TRE intervention had a positive effect in reducing fat mass, blood pressure, triglyceride levels, and markers of oxidative stress compared with a population without meal time restrictions. Therefore, they believe that TRE is a safe dietary intervention to affect obesity and cardiovascular disease. (Gabel et al., 2021)

Światkiewicz and his group presented quantitative research of the effects of a greater than 14-hour TRE intervention on metabolic, neuroendocrine, inflammatory and oxidative stress and cardiac standard parameters in Polish adults (18-75 years) and is still recruiting participants. The primary objective of the study was to collect large-scale data through the myCircadianClock mobile software to enable a randomized controlled trial to further determine the effect of long-term TRE on cardiometabolic health in the MeTS population. (Światkiewicz, et al., 2021)

Peters and his group proposed a research protocol for the effects of eTRE (8:00-16:00) and lTRE (13:00-21:00) on parameters such as insulin sensitivity, blood sugar, blood lipids in female obese patients. Its research is to prove 3 expectations. First, they wanted to demonstrate that both modes of eating intervention improved blood sugar, metabolism, insulin sensitivity, and more. Second, they believe that people with diabetes will improve their blood sugar status more effectively than normal people. Human blood pressure, blood triglycerides, total and LDL cholesterol, and sleep quality may decrease. Finally, they hypothesized that the effects of the two different approaches on the body's circadian rhythms may be opposite. (Peters et al., 2021)

Park and his group investigated the effects of 4-week late TRE on body weight and cardiometabolic risk factors in 33 night-worked adults. The results showed that most of the test subjects had a significant reduction in fat mass after 4 weeks. Both fasting insulin and insulin resistance are moving in a positive direction. And there were no significant changes in sleep duration, sleep quality, and psychometric measurements. However, they argue that their study had a small sample size, so the findings cannot yet justify a wider rollout. In addition, they did not assess the dietary intake of the target population before TRE intervention and lacked comparisons of dietary changes before and after TRE intervention. Finally, they did not consider the effect of target population gender on TRE outcomes. (Park et al., 2021)

Since 2008, experts had proposed a problem that eating speed, eating frequency, and food quality might affect the risk of MeTS. Garcidueñas-Fimbres and his group conducted qualitative research on such problem in 2021. They summarized reliable research essays, journals from PubMed and Web of Science as evidence. The evidence showed that children and adults who ate more quickly may increase the risk of MeTS whereas people who eat more frequently may reduce the risk. The diet quality also has an impact on the risk of MeTS. (Garcidueñas-Fimbres et al., 2021)

Charlot and his group summarized the impact and importance of circadian rhythms and lifestyle habits on metabolic health. At the same time, they also proposed three possible limitations of TRE. The first is the restriction of TRE on the eating window. It is because that people need to maintain family, work, and life, it is difficult to adhere to the requirements of the eating window exactly every day. Second, TRE currently is lack of standard protocol rules for setting the optimal time for the eating window. Finally, they mentioned that the effect of TRE may be affected by seasonal factors, so different eating window time rules need to be set for different seasons. They assessed the advantages and disadvantages of TRE for the treatment and prevention of metabolic diseases. (Charlot et al., 2021)

Wilkinson and his group conducted a study on whether TRE/TRF could conflict with drug treatment. The results suggest that TRE has a positive effect on cardiometabolic health in patients with metabolic syndrome. It can help patients enhance drug absorption capacity and accelerate recovery efficiency. At the time, they considered TRE to be an implicitly powerful way of life, and proposed that medical practices could consider formalizing it as a treatment regimen for metabolic syndrome. (Wilkinson et al., 2020)

In the medical field, data on TRE's role in weight loss, cardiometabolic health, and human health are controversial. Schuppelius and his group conducted a clinical experimental study on the effect of TRE on glucose and lipid metabolism. Trial data suggest that TRE has a positive effect on the target population's glucose levels both before and after meals. At the same time, TRE can affect the sensitivity of patients to insulin. They suggest that some studies showing adverse effects of TRE on blood glucose and lipids may be due to different parameter designs. For example, eating window time setting, calorie intake changes, etc. It may also be related to the target population, such as metabolic status, age, gender, etc. Finally, based on the experimental data, they still believe that TRE has a positive effect on the prevention and treatment of glucose and lipid metabolism disorders. (Schuppelius et al., 2021)

Manoogian and his group states that circadian rhythm disturbances can lead to a greatly increased risk of chronic metabolic disease in patients. They concluded that TRE/TRF shortening the daily eating window would contribute to circadian rhythm stabilization. According to the study, they confirmed that the experimental population can reduce the risk of obesity, diabetes, and cardiovascular disease under the intervention of TRE. And, epidemiological studies also advance similar concepts. Extended night fasting can help reduce the risk of chronic disease. However, they also suggested that more separate clinical studies are needed to demonstrate the effect of TRE intervention on the prevention and control of chronic metabolic diseases. (Manoogian et al., 2022)

**Future feasibility of TRE**

Some studies had used mobile apps for data collection and TRE monitoring. This would make it easier for scientists to recruit large numbers of trial participants via mobile apps in the nearly future.

Phillips and his group used a smartphone app as a tool to study the effects of eating time, unprocessed food, and processed food on metabolism in adults. Data is collected by manually recording parameters such as eating type, eating time, and personnel activities through the APP. The data showed that the 6-month TRE intervention staff lost 1.6% of their body weight. Those who ate a normal diet gained 1.1 percent. They wanted to demonstrate the potential assistance of smart APPs in assisting the implementation of TRE interventions by monitoring and collecting data through smart APPs. And it is proposed that further research is needed on the time setting of TRE intervention for different conditions and different patients' eating windows. (Phillips et al., 2021)

Światkiewicz and his group summarized the TRE pilot study evidence for MeTS through 2021. Multiple studies have demonstrated the feasibility of TRE and its positive effects on body fat, obesity, blood pressure and other issues without changing dietary quantity, quality, exercise factors. They propose future prospects for implementing TRE in the prevention and treatment of MeTS. However, they summarize the following problems faced by TRE. For example, the TRE research participants are different, the sample size is small, the TRE duration is short, and the TRE eating window time setting is different. In addition, they raised the question of the widely fluctuating effect of TRE on glucose and lipid metabolism in the MeTS population. Further research and verification are needed to determine whether long-term TRE has adverse effects in humans. (Światkiewicz, et al., 2021)

Crose and his group conducted a randomized crossover comparative analysis of the effect of TRE on quality of life in obese people. They compared the effects of TRE interventions on human physical functioning, emotional well-being, physical pain, energy changes, social functioning and general health. The results indicated that TRE intervention did not adversely affect quality of life. However, they also suggested that the mood swings in the female sample were more pronounced than those in the males. At the same time, the limitations of TRE intervention time and sample size may affect the accuracy of the conclusions. Further experiments are needed to confirm their findings. (Crose et al., 2021)

Theses literature review suggests that TRE could bring some health benefits to many diseases. These diseases come from different age groups. For example, obesity is the main problem to be prevented and faced by children and adolescents (Age <25). Metabolic syndrome is a major problem in the elderly (Age >50). There are also some female diseases for women only that TRE can help. These different diseases and target populations mean that optimum TRE Window time needs to be tailored for different genders, ages and backgrounds in order to avoid adverse effects.

## Prior research method

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ID & link | Author Name | Participant and age | Research Method | Mainly research issues | Issues may face in the future (limitation) |
| Short-term disease impact | | | | | |
| [1](https://doi.org/10.3390/nu13124321) | Stabouli et al.  2021 | Children and Adolescents | Quantitative research | Eating Disorders (ED) affect the **obesity** in Children and Adolescents. | Mental health may affect obesity and ED. |
| [2](https://doi.org/10.3390/NU13041155) | Lobene et al.  2021 | 20 adults  (Age 18-65) | Quantitative research | The effect of TRE on **Bone**. | The trail does not include elder people and children.  Smoking and alcohol may affect TRE results. |
| [3](https://doi.org/10.3390/nu13010191) | Currenti et al.  2021 | 50 women 48 men (mean age 65) | Quantitative research | TRF affect **Cognitive** **Status** in older Italian adults. | Trail too little about TRF and cognitive Status.  Need more trails on the effect of Cognitive status, regional brain volumes, neural network activity, and cerebrospinal fluid. |
| [4](https://doi.org/10.1016/j.arr.2016.10.005) | Mattson et al.  2017 | / | Qualitative research | Effects of intermittent fasting on **health and disease**. | IF may improve health and prevent fighting aging diseases. |
| [5](https://doi.org/10.3390/nu13082525) | Chawla et al.  2021 | 17 women 40 men  (Age 38±11.2) | Quantitative research | TRE effects on Cortisol and **Melatonin Secretion (Factors of Circadian Rhythms)**. | Pregnancy, pathology, and exercise status may affect TRE results.  Ramadan effects. |
| [6](https://doi.org/10.1016/j.arr.2016.12.006) | Manoogian & Panda  2017 | Animals (Mice & Drosophila) and humans | Quantitative research | Relationship among **Circadian Rhythms**, TRF and **Aging** characteristics. | Feeding/fasting patterns may improve health. |
| [7](https://doi.org/10.3390/nu11061234) | Jamshed et al.  2019 | 18 Adults  (Age 20-45) | Quantitative research | eTRF improve the glucose level, **Circadian Clock**, **Aging** and Autophagy. | Sample size too small.  Trial period is too short.  Inconsistencies in data measurement time might lead to some errors. |
| Chronic disease impact | | | | | |
| [8](https://doi.org/10.3390/nu13103476) | Christensen & Kirkham  2021 | Ladies  (age >18) | Quantitative research | TRE can prevent **Breast Cancer** and **Cardiovascular Disease**. | TRE trial period is too short.  TRE barriers.  Currently no trial in cancer or cardiovascular disease. |
| [9](https://doi.org/10.1007/s11883-021-00922-7) | Gabel et al.  2021 | / | Qualitative research | Effect of TRE in **Cardiovascular Health**. | TRE trial period is too short.  Sample size is too small.  Comparation of TRE and traditional dieting method.  Cross-over method not a good method.  No trial study on maintains weight loss. |
| [10](https://doi.org/10.3390/nu13020346) | Światkiewicz, Mila-Kierzenkowska, et al. 2021 | 30 Before  N (After) | Quantitative research | TRE reduces **Cardiometabolic risk.** | Sample size too small.  Age limit. |
| [11](https://doi.org/10.3389/fnut.2021.765543) | Peters et al.  2021 | 30 overweight ladies  (Age 18-70) | Quantitative research | eTRE VS lTRE on **Cardiometabolic Health**. | Different age, gender, and chronotypes and subjects with diabetes, metabolic syndrome. |
| [12](https://doi.org/10.3390/nu13072164) | Park et al.  2021 | 34 adults (Age 18-28) | Quantitative research | TRE effects on **Body Composition** and **Cardiometabolic**. | Sample size too small  Single-arm study with no comparation.  Does not collect the data before TRE intervention. |
| [1](https://doi.org/10.3390/nu13051687)3 | Garcidueñas-Fimbres et al.  2021 | Children and adults | Quantitative research | Effect of eating speed, eating frequency, and food quality to the risk of **MeTS**. | Trial period is too short. |
| [14](https://doi.org/10.3390/nu13051405) | Charlot et al.  2021 | / | Qualitative research | Effects of eTRF on **Metabolic Diseases**. | May lead to isolation, loneliness or depression.  Lack of protocol standardization.  Season change may affect the result. |
| [15](https://doi.org/10.1016/J.CMET.2019.11.004) | Wilkinson et al.  2020 | 35 adults and mice  (Age 59±11.14) | Quantitative research | TRE & TRF can reduce the risk of **MeTS**. | TRE & TRF may conflict with cardiovascular drugs, lipid-lowering drugs, antihypertensive drugs, and antidiabetic drugs. |
| [16](https://doi.org/10.3389/FENDO.2021.683140) | Schuppelius et al.  2021 | People  (Age 18-70) | Quantitative research | Effect of TRE in **Metabolic Disturbances**. | Changes in nutrient and calorie intake during TRE.  Comparation of eTRE and lTRE.  Differences in the time setting of different eating windows.  Based on long-term, large-participant trials. |
| [17](https://doi.org/10.1016/j.arr.2016.12.006) | Manoogian et al.  2022 | / | Qualitative research | Effect of TRE in prevent and manage **Metabolic Diseases**. | Success of TRE relate to self-monitoring, education, and compliance.  TRE challenges and barriers. |
| Future Feasibility of TRE | | | | | |
| [18](https://doi.org/10.3390/NU13031042) | Phillips et al.  2021 | 213 adults (mean age 40.1) | Quantitative research | The effect of TRE and Standard Eating. | Data lost by mobile apps.  Drugs interference. |
| [19](https://doi.org/10.3390/NU13010221) | Światkiewicz, et al.  2021 | Adults  (Age 18-70) | Quantitative research | The future of TRE and MeTS. | Sample size too small.  Some trail results may not suitable for MeTS participant.  The trail periods too short.  TRE time setting may have different results.  Need standard window time setting. |
| [20](https://doi.org/10.3390/NU13051430) | Crose et al. 2021 | 17 women and 3 men (Age 45.5±12.1) | Quantitative research | The effect or TRE on the life **quality** of obesity people. | Sample size too small.  Weight loss may affect mental health.  Mental health help to promote TRE to the world. |

## Conceptual framework for purposed research (optional)

Thematic method approach

# Research Methodology

## Research design

The goal of this research is to confirm through data analysis whether TRE is applicable to all age groups. The research technology is going to use secondary research. The quantitative research will begin with a theoretical background analysis and aggregation of literature from at least 50 quantitative journals that collect from web of science.

## Data source and type

The data source will be collected and aggregated of from the trail data in the 50 literatures. The data may include the populations of different age groups, and the parameters of the experimental studies may be inconsistent. The next step is to categorize the aggregated data according to the age group of the target population to get the raw data. Such as younger than 18, from 18 to 55, and order than 55. The data parameters maybe inconsistent, so the new column will be added if there is a new parameters type appears in a new journal. After the data is collected and the null data will be processed in data cleaning step.

## Research instrument

The research instrument tool for this research is going to be Research Journal. This instrument requires to collect data from a journal article. Journal article are scholar articles that publish by other researchers, professors, and other experts.

## Tools used to analyze

Excel is going to be used for data integration.

Python is going to be used for data cleaning, data visualization and do the exploratory data analysis (EDA).

## Data validation and reliability

**Validation**

The dataset will cover experimental data from 5 different journals. The variables for these data will certainly vary. Therefore, it is very important to properly clean some of the noise and invalid data in the data cleaning stage.

Second, when conducting exploratory analysis, researchers must correctly recognize some biasing factors that the data may contain. For example, whether the original author has accurately recorded the patient's data when conducting the test and data recording.

**Reliability**

Articles from journal are more academic, professional, and reliable than sources such as news and newspapers. Because these articles are published by professional researchers and experts from all walks of life and have been strictly reviewed.

In addition, all exploratory analysis will be based on data visualization for objective and unbiased analysis. Researchers should take into account other possibilities for some effects as much as possible while basing their analysis on the data visualization itself. For example, changes in the type of food a patient eat is another factor that may lead to changes in patient health parameters in addition to TRE interventions.

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