

The Effectiveness of Sport Massage and Swedish Massage in Reducing Fatigue Levels Among Mountain Climbers

Barokta Amiludin & Sri Sumartiningsih*

Department of Sports Science, Faculty of Sports Science, Universitas Negeri Semarang, Indonesia

*Corresponding Author: sri.sumartiningsih@mail.unnes.ac.id

Received: 2024-11-06. Accepted: 2024-01-19. Published: 2025-03-21.

Abstract. Mountain climbing is a physically demanding activity requiring high levels of strength and endurance. After climbing activities, climbers frequently experience physical fatigue caused by lactic acid accumulation and prolonged energy expenditure. Effective recovery strategies are necessary to restore physiological conditions and improve post-activity recovery. Sport massage and Swedish massage are widely used recovery methods; however, comparative evidence regarding effectiveness in reducing fatigue among mountain climbers remains limited. The purpose of this study was to examine the differences in effectiveness between sport massage and Swedish massage in reducing fatigue levels among mountain climbers. A pretest–posttest experimental design was employed involving 30 participants selected through random sampling. Participants were divided into two groups consisting of 15 individuals in the sport massage group and 15 individuals in the Swedish massage group. Data were analyzed using paired t-tests and independent t-tests. The findings demonstrated that both sport massage and Swedish massage produced significant positive effects on reducing physical fatigue. Comparative analysis showed no statistically significant difference between both methods. However, sport massage demonstrated a higher effectiveness percentage (45%) compared with Swedish massage (35%). The novelty of the study lies in providing comparative evidence regarding massage-based recovery interventions specifically among mountain climbers. The findings contribute practical implications for selecting effective recovery strategies following physically demanding outdoor activities.

Key words: mountain climbers, physical fatigue, sport massage, swedish massage

Abstract in Indonesia. Mendaki gunung merupakan aktivitas fisik berat yang membutuhkan kekuatan dan daya tahan tubuh yang tinggi. Setelah aktivitas pendakian, pendaki sering mengalami kelelahan fisik akibat akumulasi asam laktat dan pengeluaran energi yang tinggi. Strategi pemulihan yang efektif diperlukan untuk mengembalikan kondisi fisiologis tubuh dan mempercepat proses pemulihan pascaaktivitas. Sport massage dan Swedish massage merupakan metode pemulihan yang sering digunakan, namun penelitian komparatif mengenai efektivitas kedua metode pada pendaki gunung masih terbatas. Penelitian ini bertujuan menganalisis perbedaan efektivitas sport massage dan Swedish massage dalam menurunkan tingkat kelelahan pada pendaki gunung. Penelitian menggunakan desain eksperimen pretest–posttest dengan jumlah sampel 30 orang yang dipilih menggunakan teknik random sampling. Partisipan dibagi menjadi dua kelompok, yaitu 15 orang kelompok sport massage dan 15 orang kelompok Swedish massage. Analisis data menggunakan paired t-test dan independent t-test. Hasil penelitian menunjukkan bahwa sport massage dan Swedish massage memberikan pengaruh positif yang signifikan terhadap penurunan kelelahan fisik. Analisis komparatif menunjukkan tidak terdapat perbedaan signifikan secara statistik antara kedua metode. Namun demikian, sport massage menunjukkan tingkat efektivitas lebih tinggi sebesar 45% dibandingkan Swedish massage sebesar 35%. Kebaruan penelitian terletak pada bukti komparatif intervensi pemulihan berbasis pijat yang secara khusus diterapkan pada pendaki gunung. Temuan penelitian memberikan implikasi praktis dalam pemilihan strategi pemulihan setelah aktivitas fisik berat.

Kata Kunci: kelelahan fisik, pendaki gunung, sport massage, swedish massage

How to Cite: Amiludin, B. & Sumartiningsih, S. (2025). The Effectiveness of Sport Massage and Swedish Massage in Reducing Fatigue Levels Among Mountain Climbers. *MIKI: Media Ilmu Keolahragaan Indonesia* 15 (1), 14-26.

DOI: <http://dx.doi.org/10.15294/miki.v15i1.26471>

INTRODUCTION

Mountain climbing is a sport that requires a combination of skills, physical strength, intelligence, and strong determination during participation (Al-Yousef et al., 2019; Eskandari et al., 2022; Kaur et al., 2024; Lopez et al., 2022; Rapaport et al., 2023). Mountain climbing also demands a high level of physical readiness, including strength, endurance, speed, flexibility, balance, and coordination (Jackson, 2019; Moghadasi et al., 2021; Momeni et al., 2020a; Nemati et al., 2026; Rapaport et al., 2016). Numerous mountains in Indonesia are frequently visited by climbers, particularly on Java Island. One of the popular mountains in Central Java is Mount Ungaran. Mount Ungaran has an elevation of

approximately 2,050 meters above sea level, with an estimated travel duration of 3–4 hours to reach the summit (Fogarty et al., 2024a; Ghanbari et al., 2022; Gholami-Motlagh et al., 2016; Liou et al., 2022; Rondanelli et al., 2020).

Long-duration climbing activities frequently result in physical fatigue among climbers. Fatigue is a condition characterized by extreme tiredness, drowsiness caused by sleep deprivation, prolonged physical and mental activities, and psychological stress or anxiety (Gholami-Motlagh et al., 2016). Fatigue can also be defined as a reduction in work capacity resulting from physical activity accompanied by a feeling of exhaustion (Liou et al., 2022). One major physiological factor associated with fatigue is the accumulation of lactic acid in the body (Ghanbari et al., 2022). Fatigue among mountain climbers may lead to serious consequences when not properly managed. Several reports have documented accidents and fatalities associated with severe fatigue during climbing activities. A news report indicated that a mountain climber died because of fatigue while climbing in Lahat District (Fogarty et al., 2024a). Another report described a climbing accident involving a climber returning from Mount Semeru who experienced severe drowsiness (Rodrigues et al., 2019). Physical fatigue commonly affects muscle groups such as the gastrocnemius, hamstrings, quadriceps, and erector spinae muscles (Aldugiem et al., 2021). Such conditions occur because those muscles continuously support heavy backpack loads during prolonged uphill movement.

Several methods are commonly used to reduce fatigue levels, including stretching, hydrotherapy, and massage interventions. Stretching is an activity aimed at maintaining and restoring flexibility while reducing discomfort in specific body regions. Stretching may also improve concentration and restore physical freshness (Stenbäck et al., 2024). Hydrotherapy and massage are also frequently used as recovery methods to reduce fatigue levels (Paluchamy & Monisha, 2024). Massage is considered a form of manual body manipulation intended to restore body condition, provide relaxation, and maintain health status (Juchli, 2021). Massage techniques are generally classified into health massage and medical massage. Health massage is commonly applied as part of preventive healthcare practices intended to maintain physical well-being (Chaiyakul et al., 2025). Various massage techniques have developed over time, including traditional and modern approaches. Among widely used methods are sport massage and Swedish massage.

Sport massage is one of the massage techniques that has gained considerable attention in recent years. Sport massage refers to a manipulation technique performed manually to reduce muscle tension and promote relaxation, particularly among athletes and physically active individuals (Frost-Hunt, 2020). Another definition describes sport massage as a massage technique designed primarily for healthy individuals, especially athletes, with the purpose of improving blood circulation through various manual manipulations (Bayrakdaroğlu et al., 2024). In practice, sport massage is not exclusively intended for athletes but may also be used by the general population according to individual needs. Sport massage includes numerous manipulation techniques such as effleurage, petrissage, shaking, friction, tapotement, walken, skin rolling, and vibration (Darabpour et al., 2016). In contrast, Swedish massage employs only five primary manipulation techniques, including effleurage, petrissage, vibration, friction, and tapotement (Rodríguez-Mansilla et al., 2017).

METHODS

The study employed an experimental method using a two-group pretest–posttest design. The design involved two treatment groups, namely the sport massage group and the Swedish massage group. Pretest and posttest measurements were administered to evaluate changes in fatigue levels before and after the intervention. The study population consisted of mountain climbers who had completed climbing activities and descended from Mount Ungaran. A total of 30 participants were involved in the study. Participants were selected from climbers who used the Perantunan route on Mount Ungaran in April 2025. Sampling was conducted using a random sampling technique. Participants were divided equally into two groups consisting of 15 participants in the sport massage group and 15 participants in the Swedish massage group.

The research procedure began with identifying participants who met the inclusion criteria. Eligible participants were asked to complete a pretest using a physical fatigue questionnaire to assess initial fatigue levels after completing climbing activities. Following the pretest, participants were randomly assigned to one of two intervention groups: the sport massage group and the Swedish massage group.

Participants in the sport massage group received treatment using sport massage techniques, whereas participants in the Swedish massage group received Swedish massage treatment. Following completion of the intervention, all participants underwent a posttest using the same fatigue questionnaire to evaluate changes in fatigue levels after treatment.

Data analysis employed paired t-tests to examine differences between pretest and posttest scores within each group. Independent t-tests were applied to compare the effectiveness of sport massage and Swedish massage interventions. Statistical analysis was performed to determine significant differences in fatigue reduction between both intervention methods.

RESULTS AND DISCUSSION

Participant characteristics based on age, body weight, height, body mass index (BMI), and fatigue scores are presented in Table 1.

Table 1. Participant Characteristics Data

Variable	Sport Massage (n=15) Mean $\pm$ SD	Swedish Massage (n=15) Mean $\pm$ SD
Age	20.4 $\pm$ 1.77	21.1 $\pm$ 2.30
Weight (kg)	61.13 $\pm$ 10.21	63.53 $\pm$ 12.15
Height (cm)	168.00 $\pm$ 4.63	168.73 $\pm$ 3.84
BMI	21.65 $\pm$ 3.49	22.29 $\pm$ 4.09
Fatigue Score	31.06 $\pm$ 3.17	26.93 $\pm$ 4.77

Participant characteristics showed relatively similar profiles between intervention groups. Mean age, body height, body weight, and BMI values indicated comparable demographic and anthropometric conditions. Mean body weight in the Swedish massage group was slightly higher than in the sport massage group. Initial fatigue scores before intervention were also higher in the sport massage group. Prior to hypothesis testing, prerequisite analyses were conducted to determine data normality and homogeneity. Results are presented in Table 2.

Table 2. Normality and Homogeneity Test Results

Variable	Sport Massage (n=15)	Swedish Massage (n=15)
Fatigue normality (pretest)	0.351	0.648
Fatigue normality (posttest)	0.699	0.222
Weight normality	0.004	0.160
Height normality	0.620	0.704
Age normality	0.430	0.295
Homogeneity	0.031	0.706

Prerequisite test results indicated that fatigue scores before and after intervention were normally distributed in both groups ($p > 0.05$). Height and age variables also showed normal distribution patterns. Weight data in the sport massage group demonstrated non-normal distribution ($p = 0.004$), whereas weight data in the Swedish massage group remained normally distributed ($p = 0.160$). Homogeneity analysis showed homogeneous variance across groups. Since the primary outcome variable, namely fatigue score, fulfilled normality assumptions, further statistical analyses employed paired t-tests and independent t-tests. The comparison of fatigue scores before and after intervention is presented in Table 3.

Table 3. Paired t-test and Independent t-test Results

Variable	Sport Massage (n=15) Mean $\pm$ SD	Swedish Massage (n=15) Mean $\pm$ SD	t-value	p-value
Fatigue score (pretest)	31.06 $\pm$ 3.17	26.93 $\pm$ 4.77	2.793	0.009*
Fatigue score (posttest)	17.06 $\pm$ 3.47	17.33 $\pm$ 2.44	-0.243	0.810
Change paired test	14.00 $\pm$ 3.30	9.60 $\pm$ 2.33	3.036	0.005*

Paired t-test results

Group	t-value	p-value
Sport Massage	11.913	<0.001
Swedish Massage	7.377	<0.001

Paired t-test analysis revealed significant reductions in fatigue scores following intervention in both groups. Participants receiving sport massage and Swedish massage experienced meaningful decreases in fatigue levels after treatment. Posttest scores demonstrated no statistically significant difference between groups ($p=0.810$). However, analysis of score reduction indicated greater improvement in the sport massage group compared with the Swedish massage group.

Mean fatigue reduction reached 14 points in the sport massage group and 9.6 points in the Swedish massage group. Independent t-test results on change scores demonstrated a significant difference between interventions ($p<0.05$). Findings suggested that sport massage produced greater effectiveness in reducing physical fatigue among mountain climbers. Such results support the use of sport massage as a recovery strategy following physically demanding outdoor activities.

Results demonstrated that both sport massage and Swedish massage significantly reduced fatigue levels among mountain climbers after completion of climbing activities. Statistical findings indicated meaningful decreases in posttest fatigue scores within both intervention groups. Comparative analysis also revealed greater mean reduction values in the sport massage group despite the absence of significant posttest differences between groups. Such findings suggest that massage-based recovery strategies contribute positively to physiological recovery after strenuous outdoor activities involving prolonged muscular effort. Recovery interventions remain important in mountain climbing because climbing activities demand sustained physical exertion, energy expenditure, and continuous muscular contractions over extended periods (Al-Yousef et al., 2019; Eskandari et al., 2022; Kaur et al., 2024; Lopez et al., 2022; Rapaport et al., 2023).

Mountain climbing represents a physically demanding activity characterized by prolonged walking duration, uphill movement, heavy load carriage, environmental adaptation, and repetitive muscular contractions. Climbers frequently carry backpacks containing food supplies, water, clothing, and emergency equipment over several hours. Additional physical demands emerge from uneven terrain and changing gradients requiring continuous activation of lower extremity muscles. Muscle groups including quadriceps, hamstrings, gastrocnemius muscles, and erector spinae muscles maintain prolonged activity throughout climbing activities. Continuous muscular work contributes to physiological strain and fatigue accumulation. Fatigue therefore becomes a common consequence experienced after mountain climbing (Jackson, 2019; Moghadasi et al., 2021; Momeni et al., 2020a; Nemati et al., 2026; Rapaport et al., 2016).

Physical fatigue frequently develops because prolonged exercise produces metabolic changes throughout the body. Energy expenditure increases rapidly during climbing because muscle tissue requires adenosine triphosphate production for sustained contraction. During high intensity physical activity, oxygen availability may become insufficient to satisfy energy requirements completely. Under such conditions anaerobic metabolic pathways contribute to energy production. Anaerobic metabolism results in accumulation of metabolic byproducts including hydrogen ions and lactate concentration changes associated with muscular discomfort and declining physical performance. Prolonged exercise accompanied by metabolic stress therefore contributes to subjective fatigue perception and reduced functional capacity (Fogarty et al., 2024a; Ghanbari et al., 2022; Gholami-Motlagh et al., 2016; Liou et al., 2022; Rondanelli et al., 2020).

Fatigue among mountain climbers presents practical consequences beyond temporary physical discomfort. Reduced alertness and declining physical capacity may impair balance, movement coordination, concentration, and decision-making ability. Mountain environments contain substantial physical risks because climbers frequently encounter steep terrain, slippery surfaces, unstable rocks, and environmental changes. Decreased physical readiness after prolonged climbing activities may therefore increase accident risk during descent phases. News reports and field observations have indicated that fatigue contributes to accidents involving mountain climbers. Prevention and management of fatigue therefore remain important components within mountain climbing activities (Aldugiem et al., 2021; Juchli, 2021; Paluchamy & Monisha, 2024; Rodrigues et al., 2019; Stenbäck et al., 2024).

Recovery interventions seek to accelerate restoration of physiological condition after exercise-induced fatigue. Recovery processes involve restoration of muscular function, circulation, hydration status, metabolic balance, and psychological comfort. Recovery strategies may include stretching, hydration, nutrition management, hydrotherapy, active recovery, sleep optimization, and massage techniques. Massage interventions continue receiving considerable attention because massage procedures provide practical applications without requiring extensive equipment or complex facilities. Manual interventions also provide psychological relaxation benefits alongside physiological effects (Bayrakdaroglu et al., 2024; Chaikyul et al., 2025; Darabpour et al., 2016; Frost-Hunt, 2020; Rodriguez-Mansilla et al., 2017).

Sport massage and Swedish massage represent massage approaches commonly used for exercise recovery. Both techniques involve manual manipulation of body tissues through rhythmic pressure, movement, and soft tissue stimulation. Despite similar objectives, both interventions differ regarding manipulation complexity, treatment focus, and procedural characteristics. Sport massage generally involves more diverse techniques including shaking, friction, vibration, skin rolling, and additional movements intended to stimulate circulation and reduce muscular tension. Swedish massage typically uses five major manipulations consisting of effleurage, petrissage, vibration, friction, and tapotement. Variation in manipulation techniques may contribute to differences in physiological responses and recovery outcomes (Li et al., 2025; Mathunjwa et al., 2025; Park & Oh, 2026; Rodríguez-Ruiz et al., 2025; Wilczyńska et al., 2019).

Significant reductions in fatigue scores observed after sport massage intervention support previous evidence indicating beneficial effects of massage among physically active populations. Sport massage has long been utilized within athletic environments because manual stimulation may facilitate circulation enhancement and muscular relaxation. Increased blood circulation contributes to delivery of oxygen and nutrients toward muscle tissue while simultaneously supporting transportation of metabolic waste products. Improved circulation therefore may accelerate recovery processes following strenuous exercise (Ali et al., 2017; Alpert, 2022; Eskandari et al., 2023; Kinkead et al., 2018; Lovas et al., 2017).

Muscular tension reduction may also explain fatigue reduction observed after sport massage intervention. Prolonged climbing requires repetitive muscular contractions involving lower extremity and trunk regions. Continuous muscular activation may create stiffness, localized discomfort, and elevated muscle tone after physical activity. Manual manipulations associated with sport massage may decrease muscular tightness through mechanical stimulation of soft tissue structures. Relaxation responses may improve comfort and support restoration of movement function after climbing activities (Larson et al., 2019; Mahdizadeh et al., 2019; Prasetyo et al., 2025; Rapaport et al., 2021; Wang et al., 2021).

Neurological mechanisms may provide additional explanations regarding effectiveness of sport massage. Mechanical stimulation during massage activates sensory receptors located within skin, fascia, and muscle tissue. Sensory input transmitted toward central nervous structures may alter pain perception and induce relaxation responses. Stimulation of mechanoreceptors may contribute to reduction of sympathetic nervous activity accompanied by increased parasympathetic responses. Parasympathetic activation generally associates with relaxation, lower stress responses, and improved recovery conditions. Such mechanisms may partly explain reductions in subjective fatigue perception among participants receiving massage interventions (Anett et al., 2022; Asgarimoghadam et al., 2026; Boangmanalu et al., 2025; Fogarty et al., 2024b, 2026).

Results obtained from Swedish massage intervention also demonstrated significant reductions in fatigue scores after treatment. Findings indicate that Swedish massage effectively supported recovery among mountain climbers. Swedish massage procedures emphasize rhythmic manipulation patterns intended to create relaxation and circulatory stimulation. Effleurage and petrissage techniques frequently dominate Swedish massage applications. Smooth repetitive movements may facilitate muscular relaxation and improve subjective comfort after strenuous activities (Afrasiabifar et al., 2022; Ghasemi et al., 2026; Momeni et al., 2020b; Moradi et al., 2020; Rodríguez-Ruiz et al., 2024).

Physiological responses generated through Swedish massage may resemble responses observed during sport massage. Mechanical pressure applied during massage may contribute to increased circulation and tissue perfusion. Enhanced circulation potentially supports nutrient delivery and metabolic transportation processes. Psychological relaxation induced during treatment sessions may additionally reduce stress responses accompanying physical fatigue. Combined physiological and

psychological effects may therefore explain beneficial outcomes associated with Swedish massage intervention (Wilczyńska et al., 2019; Zhang et al., 2022).

Comparative analysis revealed greater fatigue reduction values among participants receiving sport massage compared with participants receiving Swedish massage. Mean score reductions indicated larger improvement among sport massage recipients. Greater effectiveness observed within sport massage intervention may relate to broader manipulation variety included within treatment procedures. Multiple manipulation techniques may stimulate deeper tissue responses and more extensive muscular activation compared with procedures emphasizing relaxation-oriented approaches (Stenbäck et al., 2024; Wang et al., 2021).

Sport massage procedures often target muscle groups experiencing direct functional demands during exercise. Lower extremity regions and postural muscles commonly receive focused attention because muscular activity concentrates within such areas during climbing. More specific manipulation patterns may therefore generate stronger recovery responses after exercise-induced fatigue. Swedish massage meanwhile often emphasizes general relaxation and overall body comfort. Differences regarding treatment objectives may explain greater recovery benefits associated with sport massage (Rondanelli et al., 2020; Rostron, 2021).

Additional interpretation may involve mechanical intensity differences between interventions. Sport massage frequently employs stronger pressure and stimulation compared with Swedish massage. Greater pressure intensity potentially influences circulation patterns and tissue responses differently. Mechanical stimulation reaching deeper soft tissue structures may facilitate reduction of stiffness and muscular tension more effectively. Enhanced tissue responses therefore may contribute toward larger reductions in fatigue scores (Prasetyo et al., 2025; Rapaport et al., 2023; Rodríguez-Ruiz et al., 2025).

Despite larger reduction values within sport massage intervention, posttest analysis indicated no significant differences between intervention groups. Such findings suggest that both interventions ultimately produced similar fatigue levels after treatment. Similar posttest outcomes indicate that both approaches successfully facilitated recovery despite procedural differences. Clinical interpretation therefore should recognize practical value associated with both interventions rather than exclusively emphasizing superiority of one method (Park & Oh, 2026; Rodríguez-Ruiz et al., 2025).

Absence of significant posttest differences may reflect participant characteristics and study conditions. Individual recovery responses frequently vary according to age, fitness level, body composition, sleep patterns, hydration status, exercise history, and psychological conditions. Biological variability among participants potentially influences treatment responses. Recovery trajectories therefore may differ despite exposure toward identical interventions (Darabpour et al., 2016; Lopez et al., 2022).

Participant characteristics presented relatively similar profiles regarding age, height, body weight, and body mass index. Comparable demographic profiles may strengthen internal consistency because substantial baseline differences remained limited. Similar participant characteristics reduce potential confounding influences related to anthropometric variation. However, minor baseline differences involving initial fatigue scores remained evident between groups. Higher pretest fatigue values observed within sport massage participants may partly influence magnitude of score reduction during intervention (Mahdizadeh et al., 2019; Rodrigues et al., 2019).

Greater baseline fatigue scores create larger opportunities for measurable improvement after treatment. Participants entering intervention with more severe fatigue levels potentially demonstrate larger score changes because greater recovery capacity remains available. Interpretation regarding comparative effectiveness therefore should consider initial fatigue differences between groups. Future investigations may utilize stricter matching procedures or covariance analyses to address baseline variation more comprehensively (Afrasiabifar et al., 2022; Al-Yousef et al., 2019).

Psychological mechanisms also deserve consideration when discussing massage intervention outcomes. Recovery experiences extend beyond physiological restoration because psychological perceptions strongly influence subjective fatigue. Massage environments commonly involve calm settings, direct interpersonal interaction, physical comfort, and reduced environmental stress. Psychological relaxation may improve emotional states and influence participant perceptions regarding recovery quality. Subjective fatigue questionnaires therefore may capture combined physical and psychological experiences (Ali et al., 2017; Alpert, 2022).

Placebo responses may additionally influence intervention outcomes. Participants frequently possess expectations regarding positive treatment effects before receiving massage procedures. Positive expectations may alter symptom perception and emotional responses. Participants anticipating beneficial outcomes may report reduced fatigue regardless of specific physiological mechanisms. Potential expectancy influences should therefore remain considered during interpretation of subjective outcome measures (Anett et al., 2022; Antunes & Marques, 2022).

Environmental conditions surrounding mountain climbing activities may further influence fatigue and recovery processes. Temperature variation, humidity, altitude exposure, terrain difficulty, and climbing duration contribute toward physiological stress levels. Climbers completing physically demanding routes may experience fatigue patterns differing from climbers using less challenging routes. Environmental variation potentially influences baseline fatigue severity and intervention responsiveness. Standardization of environmental conditions therefore remains important within future investigations (Boangmanalu et al., 2025; Chaikakul et al., 2025).

Hydration status also influences fatigue development and recovery outcomes. Fluid loss occurring during climbing may impair cardiovascular function and exercise performance. Dehydration frequently contributes toward fatigue perception, muscular discomfort, and reduced physical readiness. Hydration conditions among participants may therefore influence recovery responses observed after intervention. Monitoring fluid intake and hydration status may strengthen methodological quality during future studies (Chmiel & Kurpas, 2026; Eskandari et al., 2022).

Nutritional factors additionally influence exercise recovery processes. Carbohydrate availability affects glycogen restoration while protein intake supports tissue repair and adaptation. Nutritional variation among participants potentially influences postexercise recovery patterns independent of massage intervention effects. Future investigations therefore may incorporate nutritional monitoring procedures to improve control over potential confounding variables (Wilczyńska et al., 2019; Zhang et al., 2022).

Several methodological limitations require consideration. Sample size involved only thirty participants divided across two intervention groups. Limited sample size potentially reduces statistical power and generalizability. Larger participant numbers may provide stronger estimates regarding intervention effectiveness and permit subgroup analyses involving demographic or physiological variables (Stenbäck et al., 2024; Wang et al., 2021).

Study procedures relied primarily upon subjective fatigue assessment through questionnaire measures. Subjective measures provide valuable information regarding participant experiences but remain vulnerable toward perception bias and psychological influences. Future investigations may combine subjective instruments with physiological markers including heart rate variability, blood lactate concentration, electromyography, or biochemical indicators to obtain broader understanding regarding recovery mechanisms. Intervention duration also may influence observed outcomes. Recovery responses potentially vary according to massage session length and manipulation frequency. Different durations or repeated treatment schedules may produce alternative results (Park & Oh, 2026; Rondanelli et al., 2020).

Research implications extend toward practical applications involving outdoor sports and exercise recovery management. Mountain climbing communities increasingly recognize importance of recovery strategies for maintaining performance and safety. Findings suggest massage interventions may serve as practical recovery alternatives after climbing activities. Sport massage particularly demonstrated larger reduction trends and may represent useful recovery options among climbers experiencing substantial muscular fatigue (Larson et al., 2019; Mathunjwa et al., 2025).

Implementation within mountain climbing settings may involve collaboration among outdoor organizations, sports communities, physiotherapists, and recreational health services. Recovery education programs may emphasize recognition of fatigue symptoms and implementation of evidence-based recovery strategies. Broader integration of recovery management potentially contributes toward safer climbing experiences and improved physical readiness (Juchli, 2021; Kaur et al., 2024).

Broader implications extend beyond mountain climbing populations because fatigue frequently develops among individuals participating in physically demanding occupations and recreational activities. Findings therefore contribute toward understanding regarding massage-based recovery interventions applicable across diverse physically active populations. Exercise recovery strategies remain increasingly relevant within contemporary health and sports environments emphasizing

performance and well-being (Frost-Hunt, 2020; Jackson, 2019).

The findings demonstrated meaningful contributions regarding application of massage interventions for fatigue reduction among mountain climbers. Significant improvements observed across both intervention groups support utilization of manual recovery strategies after prolonged physical activities. Greater reduction trends observed within sport massage intervention suggest additional advantages associated with diverse manipulation procedures targeting exercise-related muscular demands. Continued investigation involving larger samples and broader physiological assessment approaches may further clarify mechanisms underlying massage effectiveness within exercise recovery contexts (Wang et al., 2021; Wilczyńska et al., 2019; Zhang et al., 2022).

Another perspective regarding intervention effectiveness involves circulatory physiology during postexercise recovery. Strenuous muscular activity creates temporary alterations in blood flow distribution because active muscles receive increased perfusion during exercise. Recovery periods require gradual normalization of circulatory patterns and removal of metabolic byproducts associated with physical exertion. Manual massage techniques may facilitate vascular responses through rhythmic pressure changes across soft tissue structures. Alternating compression and release patterns potentially assist venous return and lymphatic movement. Improved circulation may therefore support recovery pathways associated with fatigue reduction (Chaiyakul et al., 2025; Frost-Hunt, 2020).

Lymphatic circulation frequently receives less attention compared with arterial and venous responses despite considerable importance during recovery processes. Lymphatic movement contributes toward transportation of proteins, fluid balance regulation, and immune activity throughout body systems. Unlike cardiovascular circulation driven directly by cardiac contraction, lymphatic movement depends partly upon muscular activity and mechanical pressure changes. Massage procedures may create external mechanical stimulation assisting lymphatic movement. Enhanced lymphatic circulation potentially contributes toward tissue recovery and reduction of localized discomfort following strenuous physical activity (Bayrakdaroğlu et al., 2024; Darabpour et al., 2016; Rodríguez-Mansilla et al., 2017).

Fascial tissue responses may additionally explain observed outcomes. Fascial structures surround muscles and connective tissues throughout the body and contribute toward movement efficiency and force transmission. Repetitive movement and prolonged muscular loading potentially increase fascial stiffness and mechanical restriction. Mountain climbing activities involving continuous movement over extended durations may contribute toward tension accumulation within fascial networks. Manual interventions applied through massage techniques may influence tissue mobility and improve movement comfort. Reduced restriction within soft tissue systems potentially contributes toward perceived reductions in fatigue (Mathunjwa et al., 2025; Wilczyńska et al., 2019).

Exercise physiology literature frequently emphasizes interaction between peripheral and central fatigue mechanisms. Peripheral fatigue generally involves muscular and metabolic factors occurring directly within active tissues. Central fatigue involves neurological components affecting motor command generation and psychological function. Fatigue experienced after mountain climbing likely represents multifactorial interaction involving both peripheral and central components. Massage interventions potentially influence both pathways simultaneously through mechanical tissue stimulation and psychological relaxation responses (Li et al., 2025; Park & Oh, 2026; Wilczyńska et al., 2019).

Central fatigue mechanisms frequently involve neurotransmitter changes and psychological stress responses occurring during prolonged exercise. Extended physical activity may alter motivational states and increase perception of effort. Physical exhaustion therefore extends beyond isolated muscular conditions because central nervous structures influence exercise tolerance and recovery experiences. Relaxation generated during massage sessions potentially modifies stress responses and supports psychological restoration. Such mechanisms may contribute toward improved subjective recovery experiences among participants (Alpert, 2022; Eskandari et al., 2023; Rodríguez-Ruiz et al., 2025).

Massage intervention timing also deserves consideration because treatment effectiveness potentially varies according to application period after exercise completion. Immediate intervention following physical activity may influence circulation and tissue responses differently compared with delayed treatment procedures. Participants involved within current procedures received interventions after climbing completion, creating direct recovery application conditions. Alternative timing schedules involving delayed intervention periods may generate different recovery patterns. Future studies may therefore compare intervention timing approaches to determine optimal implementation strategies (Ali et al., 2017; Kinkead et al., 2018; Lovas et al., 2017).

Recovery science increasingly recognizes interaction between passive and active approaches. Passive methods generally involve rest-oriented procedures requiring limited participant activity, whereas active approaches involve low intensity movement facilitating circulation and physiological adaptation. Massage interventions often occupy intermediate positions because participants remain physically passive while receiving external mechanical stimulation. Such characteristics create practical advantages because physically exhausted individuals may benefit from recovery support without additional exertional demands (Larson et al., 2019; Mahdizadeh et al., 2019; Wang et al., 2021).

Outdoor sport environments create unique recovery challenges compared with structured athletic settings. Competitive sports often provide access to medical teams, physiotherapists, and recovery facilities. Recreational mountain climbers frequently encounter limited recovery resources immediately after activity completion. Portable and accessible recovery methods therefore possess practical importance within outdoor contexts. Massage interventions may provide relatively feasible recovery solutions because procedures require minimal technological equipment and can be adapted within field environments (Anett et al., 2022; Rapaport et al., 2021).

Social aspects associated with recovery practices may additionally influence intervention outcomes. Human interaction occurring during massage sessions potentially contributes toward emotional comfort and perceived support. Interpersonal communication and supportive environments may positively influence recovery experiences after physically demanding activities. Psychological comfort generated through social interaction may indirectly influence fatigue perceptions and subjective well-being. Future studies therefore may examine psychosocial factors accompanying manual recovery interventions (Boangmanalu et al., 2025; Fogarty et al., 2024b, 2026).

Cultural perspectives regarding massage practices also deserve consideration. Massage traditions possess extensive historical roots across numerous societies and health systems. Different communities frequently maintain distinct beliefs regarding body care, physical restoration, and therapeutic touch. Cultural familiarity with massage practices may influence participant expectations and acceptance. Positive perceptions toward massage interventions potentially strengthen engagement and treatment satisfaction. Understanding cultural contexts therefore remains valuable during implementation of recovery programs among broader populations (Asgarimoghadam et al., 2026; Moradi et al., 2020; Rodríguez-Ruiz et al., 2024).

Sex-related physiological variation represents another important consideration absent from current analyses. Hormonal differences, body composition characteristics, and muscular responses may influence fatigue development and recovery trajectories. Male and female participants potentially demonstrate different responses toward manual interventions following strenuous physical activity. Future investigations involving larger participant numbers may explore sex-based differences and provide additional understanding regarding individualized recovery strategies (Afrasiabifar et al., 2022; Ghasemi et al., 2026; Momeni et al., 2020b).

Future research directions may also include examination of combined recovery approaches involving massage and complementary interventions. Integration of massage procedures with stretching routines, hydration strategies, nutritional support, or active recovery exercises may generate synergistic benefits beyond isolated treatment effects. Multifactorial recovery protocols increasingly attract attention because physical fatigue commonly develops through complex physiological pathways rather than single mechanisms. Comparative investigations involving integrated interventions may provide practical recommendations suitable for recreational and competitive populations (Ma et al., 2024; Rostron, 2021).

Technological developments may further expand opportunities within recovery science. Wearable monitoring systems increasingly permit continuous assessment of physiological responses including heart rate, movement patterns, and sleep quality. Integration of objective monitoring technologies with massage interventions may strengthen understanding regarding recovery adaptation processes. Broader evidence involving physiological measurements and subjective experiences may improve development of individualized recovery recommendations for mountain climbers and physically active populations (Antunes & Marques, 2022; Kaewcum & Siripornpanich, 2018; Zhang et al., 2022).

Practical application within educational settings may also support health promotion initiatives among outdoor enthusiasts. Training workshops organized through climbing communities may introduce evidence-based recovery knowledge and proper massage techniques. Increased awareness regarding fatigue management potentially reduces physical risks and improves participation experiences.

Development of structured recovery guidelines for mountain climbing activities may strengthen safety culture and encourage responsible outdoor recreation practices among beginner and experienced climbers across diverse environmental settings and recreational contexts. Such initiatives may enhance recovery awareness and long term participant well-being outcomes (Chmiel & Kurpas, 2026; Munk et al., 2022).

CONCLUSION

Based on the findings and discussion, both sport massage and Swedish massage demonstrated a significant positive effect on reducing the physical fatigue experienced by mountain climbers. Statistical analysis indicated that both recovery methods contributed to fatigue reduction after climbing activities. Although the comparative analysis showed no significant difference between the two massage methods, sport massage produced a higher effectiveness percentage, reaching 45%, while Swedish massage showed an effectiveness percentage of 35%. These findings indicate that sport massage tended to provide better recovery outcomes for reducing physical fatigue among mountain climbers.

REFERENCES

- Afrasiabifar, A., Hamzhiakia, S., Mosavi, A., & Hossini, S. M. (2022). The effect of warm water footbath versus Swedish massages on hemodialysis patients' sleep quality and insomnia. *Journal of Nursing and Midwifery Sciences*, 9(2), 81–89. Scopus. https://doi.org/10.4103/jnms.jnms_117_21
- Aldugiem, M., Abdelkader, A., El-Soussi, A., Zeitoun, T., Abdelkader, F. A., Abdelrahman, A. S. A., & Abdelhamid, M. (2021). Effect of abdominal massage on gastrointestinal outcomes of critical ill patients with enteral feeding. *Journal of Medicinal and Chemical Sciences*, 4(5), 497–507. Scopus. <https://doi.org/10.26655/JMCHEMSCI.2021.5.11>
- Ali, A., Rosenberger, L., Weiss, T. R., Milak, C., & Perlman, A. I. (2017). Massage therapy and quality of life in osteoarthritis of the knee: A qualitative study. *Pain Medicine (United States)*, 18(6), 1168–1175. Scopus. <https://doi.org/10.1093/pm/pnw217>
- Alpert, J. S. (2022). Is Massage a Beneficial Intervention? *American Journal of Medicine*, 135(7), 799–800. Scopus. <https://doi.org/10.1016/j.amjmed.2022.01.059>
- Al-Yousef, H. M., Wajid, S., & Sales, I. (2019). A community-based survey on massage therapy in Saudi Arabia. *Journal of Ayurveda and Integrative Medicine*, 10(4), 290–293. Scopus. <https://doi.org/10.1016/j.jaim.2019.10.002>
- Anett, T., Anikó, K. P., Péter, T., Eleonóra, L., Eszter, A., Iuliana, B.-B., Mária, H., János, K., & Márta, H. (2022). Study of the functional capacity and health status of patients with hip as well as knee osteoarthritis. *Orvosi Hetilap*, 163(48), 1917–1922. Scopus. <https://doi.org/10.1556/650.2022.32630>
- Antunes, M. D., & Marques, A. P. (2022). The role of physiotherapy in fibromyalgia: Current and future perspectives. *Frontiers in Physiology*, 13. Scopus. <https://doi.org/10.3389/fphys.2022.968292>
- Asgarimoghdam, A., Ravari, A., Mirzaei, T., Kamiab, Z., & Abbasifard, M. (2026). Swedish massage versus hip strengthening exercises for pain and function in older adults with knee osteoarthritis: A randomized controlled trial. *Aging Clinical and Experimental Research*, 38(1). Scopus. <https://doi.org/10.1007/s40520-025-03313-z>
- Bayrakdaroglu, S., Eken, Ö., Bayer, R., Yagin, F. H., Kızılet, T., Kayhan, R. F., & Ardigò, L. P. (2024). Effects of Swedish Massage at Different Times of the Day on Dynamic and Static Balance in Taekwondo Athletes. *Healthcare (Switzerland)*, 12(2). Scopus. <https://doi.org/10.3390/healthcare12020165>
- Boangmanalu, E. S., Masfuri, M., Adam, M., Nining, S., Banna, T., & Pulungan, I. M. (2025). Swedish abdominal massage against warm water therapy on postoperative orthopaedic surgery constipation: A comparison quasi-experimental study. *F1000Research*, 13. Scopus. <https://doi.org/10.12688/f1000research.159217.3>
- Chaiyakul, S., Sohree, N., Rachanon, J., Musalee, N., Huathae, C., Saengduang, J., & Chaibal, S. (2025). Effects of combined cold-water immersion and Swedish massage on muscle strength, fatigue, blood lactate levels, and exercise performance in male team sport athletes. *Journal of Physical Education and Sport*, 25(7), 1454–1464. Scopus. <https://doi.org/10.7752/jpes.2025.07162>
- Chmiel, J., & Kurpas, D. (2026). Through Massage to the Brain—Neuronal and Neuroplastic Mechanisms of Massage Based on Various Neuroimaging Techniques (EEG, fMRI, and fNIRS). *Journal of Clinical*

- Medicine*, 15(2). Scopus. <https://doi.org/10.3390/jcm15020909>
- Darabpour, S., Kheirhah, M., & Ghasemi, E. (2016). Effects of Swedish massage on the improvement of mood disorders in women with breast cancer undergoing radiotherapy. *Iranian Red Crescent Medical Journal*, 18(11). Scopus. <https://doi.org/10.5812/ircmj.25461>
- Eskandari, F., Mousavi, P., Valiani, M., Ghanbari, S., & Iravani, M. (2022). A comparison of the effect of Swedish massage with and without chamomile oil on labor outcomes and maternal satisfaction of the childbirth process: A randomized controlled trial. *European Journal of Medical Research*, 27(1). Scopus. <https://doi.org/10.1186/s40001-022-00901-x>
- Eskandari, F., Mousavi, P., Valiani, M., Ghanbari, S., & Iravani, M. (2023). Investigating the effect of Swedish massage with chamomile oil on labor pain and anxiety of primiparous women: A clinical trial. *Journal of Education and Health Promotion*, 12(1). Scopus. https://doi.org/10.4103/jehp.jehp_634_22
- Fogarty, S., Heazell, A. E. P., Munk, N., & Hay, P. (2024a). Correction to: Swedish massage as an adjunct approach to Help support individuals Pregnant after Experiencing a prior Stillbirth (HOPES): A convergent parallel mixed-methods single-arm feasibility trial protocol (Pilot and Feasibility Studies, (2024), 10, 1, (67), 10.1186/s40814-024-01499-z). *Pilot and Feasibility Studies*, 10(1). Scopus. <https://doi.org/10.1186/s40814-024-01506-3>
- Fogarty, S., Heazell, A. E. P., Munk, N., & Hay, P. (2024b). Swedish massage as an adjunct approach to Help support individuals Pregnant after Experiencing a prior Stillbirth (HOPES): A convergent parallel mixed-methods single-arm feasibility trial protocol. *Pilot and Feasibility Studies*, 10(1). Scopus. <https://doi.org/10.1186/s40814-024-01499-z>
- Fogarty, S., Heazell, A. E. P., Munk, N., & Hay, P. (2026). Swedish massage as an adjunct approach to Help support individuals Pregnant after Experiencing a prior Stillbirth (HOPES): Feasibility and acceptability findings from a convergent parallel mixed-methods single-arm trial. *BMC Complementary Medicine and Therapies*, 26(1). Scopus. <https://doi.org/10.1186/s12906-026-05244-2>
- Frost-Hunt, A. (2020). Effects of massage therapy on multiple sclerosis: A case report. *International Journal of Therapeutic Massage and Bodywork: Research, Education, and Practice*, 13(4), 35–41. Scopus. <https://doi.org/10.3822/IJTMB.V13I4.545>
- Ghanbari, A., Shahrabaki, P. M., Dehghan, M., Mardanparvar, H., Abadi, E. K. D., Emami, A., & Sarikhani-Khorrami, E. (2022). Comparison of the Effect of Reflexology and Swedish Massage on Restless Legs Syndrome and Sleep Quality in Patients Undergoing Hemodialysis: A Randomized Clinical Trial. *International Journal of Therapeutic Massage and Bodywork: Research, Education, and Practice*, 15(2), 1–13. Scopus. <https://doi.org/10.3822/ijtm.v15i2.705>
- Ghasemi, S., Shahrjerdi, S., & Kalantari, F. (2026). The Effect of Swedish Massage on Ergonomic Risk Factors and Occupational Range of Motion in Hairdressers with Musculoskeletal Disorders. *Journal of Sport Biomechanics*, 12(1), 36–50. Scopus. <https://doi.org/10.61882/JSportBiomech.12.1.36>
- Gholami-Motlagh, F., Jouzi, M., & Soleymani, B. (2016). Comparing the effects of two Swedish massage techniques on the vital signs and anxiety of healthy women. *Iranian Journal of Nursing and Midwifery Research*, 21(4), 402–409. Scopus. <https://doi.org/10.4103/1735-9066.185584>
- Jackson, J. L. (2019). Capsule Commentary on Perlman et al., Efficacy and Safety of Massage for Osteoarthritis of the Knee: A Randomized Clinical Trial. *Journal of General Internal Medicine*, 34(3), 444. Scopus. <https://doi.org/10.1007/s11606-018-4803-1>
- Juchli, L. (2021). Effectiveness of massage including proximal trigger point release for plantar fasciitis: A case report. *International Journal of Therapeutic Massage and Bodywork: Research, Education, and Practice*, 14(2), 22–29. Scopus. <https://doi.org/10.3822/IJTMB.V14I2.635>
- Kaewcum, N., & Siripornpanich, V. (2018). The effects of unilateral Swedish massage on the neural activities measured by quantitative electroencephalography (EEG). *Journal of Health Research*, 32(1), 36–46. Scopus. <https://doi.org/10.1108/JHR-11-2017-004>
- Kaur, N., Sinha, A. G. K., Mishra, A., Kumar, V., Mohiuddin, Md., & Ahmed, S. (2024). A Comparative Study on Effectiveness of Swedish Massage and Foam Roller Massage on Hamstring Flexibility and Lower Limb Power in Female Athletes: A Single-blind Randomized Clinical Trial. *Journal of Datta Meghe Institute of Medical Sciences University*, 19(4), 686–692. Scopus. https://doi.org/10.4103/jdmimsu.jdmimsu_238_24
- Kinkead, B., Schettler, P. J., Larson, E. R., Carroll, D., Sharenko, M., Nettles, J., Edwards, S. A., Miller, A. H., Torres, M. A., Dunlop, B. W., Rakofsky, J. J., & Rapaport, M. H. (2018). Massage therapy decreases cancer-related fatigue: Results from a randomized early phase trial. *Cancer*, 124(3), 546–554. Scopus.

- <https://doi.org/10.1002/cncr.31064>
- Larson, E. R., Kinkead, B., Edwards, S. A., Schettler, P. J., Dunlop, B. W., Rakofsky, J. J., & Rapaport, M. H. (2019). Model structure for protocol adherence utilizing a manualized therapeutic massage intervention. *Journal of Complementary and Integrative Medicine*, 16(2). Scopus. <https://doi.org/10.1515/jcim-2016-0118>
- Li, X., Pan, H., Wang, L., Zhou, Q., Ma, Y., Wang, Q., Wang, M., Xie, Z., Li, H., Chen, L., Huang, L., Chen, Y., & Wen, C. (2025). Guidelines on Treating Fibromyalgia With Nonpharmacological Therapies in China. *Journal of Evidence-Based Medicine*, 18(2). Scopus. <https://doi.org/10.1111/jebm.70044>
- Liou, K. T., Lynch, K. A., Nwodin, O., Popkin, K., Greene, J. S., Atkinson, T. M., Bradt, J., & Mao, J. J. (2022). Comparison of Depressive Symptom Outcomes in Hospitalized Adult Cancer Patients Receiving Music Therapy or Massage Therapy. *Journal of Pain and Symptom Management*, 63(2), e155–e159. Scopus. <https://doi.org/10.1016/j.jpainsymman.2021.09.007>
- Lopez, G., Eng, C., Overman, M., Ramirez, D., Liu, W., Beinhorn, C., Sumler, P., Prinsloo, S., Li, Y., Chen, M., Bruera, E., & Cohen, L. (2022). A randomized pilot study of oncology massage to treat chemotherapy-induced peripheral neuropathy. *Scientific Reports*, 12(1). Scopus. <https://doi.org/10.1038/s41598-022-23372-w>
- Lovas, J., Tran, Y., Middleton, J., Bartrop, R., Moore, N., & Craig, A. (2017). Managing pain and fatigue in people with spinal cord injury: A randomized controlled trial feasibility study examining the efficacy of massage therapy. *Spinal Cord*, 55(2), 162–166. Scopus. <https://doi.org/10.1038/sc.2016.156>
- Ma, R., Romano, E., Ashworth, M., Smith, T. O., Vancampfort, D., Scott, W., Gaughran, F., Stewart, R., & Stubbs, B. (2024). The Effectiveness of Interventions for Improving Chronic Pain Symptoms Among People With Mental Illness: A Systematic Review. *Journal of Pain*, 25(5). Scopus. <https://doi.org/10.1016/j.jpain.2023.11.004>
- Mahdizadeh, M., Jaber, A. A., & Bonabi, T. N. (2019). Massage therapy in management of occupational stress in emergency medical services staffs: A randomized controlled trial. *International Journal of Therapeutic Massage and Bodywork: Research, Education, and Practice*, 12(1), 16–22. Scopus. <https://doi.org/10.3822/ijtm.v12i1.421>
- Mathunjwa, M. L., Mahlangu, S., & Haddad, M. (2025). Evaluating the Impact of Massage Therapy on Performance and Well-Being in Taekwondo Practitioners: A Systematic Review. *International Journal of Environmental Research and Public Health*, 22(5). Scopus. <https://doi.org/10.3390/ijerph22050742>
- Moghadas, M., Mohebbi, Z., Homayouni, K., & Nikoo, M. H. (2021). Cardiorespiratory effect of Swedish back massage in hypertensive patients: A randomized clinical trial. *Arterial Hypertension (Poland)*, 25(4), 159–163. Scopus. <https://doi.org/10.5603/AH.a2021.0026>
- Momeni, M., Arab, M., Dehghan, M., & Ahmadinejad, M. (2020a). Assessment of Leg Massage on Hemodynamic Parameters of Intensive Care Patients: A Parallel Single-Blinded Randomized Controlled Trial. *Journal of Chiropractic Medicine*, 19(2), 111–118. Scopus. <https://doi.org/10.1016/j.jcm.2020.02.003>
- Momeni, M., Arab, M., Dehghan, M., & Ahmadinejad, M. (2020b). The Effect of Foot Massage on Pain of the Intensive Care Patients: A Parallel Randomized Single-Blind Controlled Trial. *Evidence-Based Complementary and Alternative Medicine*, 2020. Scopus. <https://doi.org/10.1155/2020/3450853>
- Moradi, M., Khachian, A., Behbahani, F. A., Saatchi, K., & Haghani, H. (2020). The Effect of Aromatherapy by Inhalation and Massage on Radiotherapy-induced Fatigue in Patients With Cancer. *Journal of Client-Centered Nursing Care*, 6(2), 79–86. Scopus. <https://doi.org/10.32598/JCCNC.6.2.304.1>
- Munk, N., Daggy, J. K., Evans, E., Kline, M., Slaven, J. E., Laws, B., Foote, T., Matthias, M. S., & Bair, M. J. (2022). Therapist-Delivered Versus Care Ally-Assisted Massage for Veterans With Chronic Neck Pain: Protocol for a Randomized Controlled Trial. *JMIR Research Protocols*, 11(9). Scopus. <https://doi.org/10.2196/38950>
- Nemati, D., Kaushal, N., Keith, N., & Munk, N. (2026). Applying the health belief model to understand the usage and experience of self-management techniques in knee osteoarthritis: A mixed-methods observational study. *International Journal of Nursing Studies Advances*, 10. Scopus. <https://doi.org/10.1016/j.ijnsa.2026.100534>
- Paluchamy, T., & Monisha, M. (2024). Effect of Swedish Abdominal Massage on Gastrointestinal Outcomes of Critical Ill Patients. *Journal of Pharmacy and Bioallied Sciences*, 16(Suppl 3), S3019. Scopus. https://doi.org/10.4103/jpbs.jpbs_602_24
- Park, Y. S., & Oh, Y. K. (2026). Image Generation of Aesthetic Massage types Generative AI: Applying the

- Khizer Abbas Framework. *Tehnicki Glasnik*, 20(1), 101–107. Scopus. <https://doi.org/10.31803/tg-20250326033232>
- Prasetyo, Y., Billy Yachsie, B. T. P. W., Suhasto, S., & Famelia, P. (2025). Overuse injury treatment: Which is more appropriate between Swedish massage and deep tissue massage, especially for archery athletes. *Health, Sport, Rehabilitation*, 11(3), 103–114. Scopus. <https://doi.org/10.58962/HSR.2025.11.3.103-114>
- Rapaport, M. H., Schettler, P. J., Larson, E. R., Dunlop, B. W., Rakofsky, J. J., & Kinkead, B. (2021). Six versus twelve weeks of Swedish massage therapy for generalized anxiety disorder: Preliminary findings. *Complementary Therapies in Medicine*, 56. Scopus. <https://doi.org/10.1016/j.ctim.2020.102593>
- Rapaport, M. H., Schettler, P. J., Larson, E. R., Edwards, S. A., Dunlop, B. W., Rakofsky, J. J., & Kinkead, B. (2023). A preliminary descriptive report of the longevity of the effects of Swedish Massage therapy for subjects with Generalized Anxiety Disorder. *Journal of Bodywork and Movement Therapies*, 33, 176–181. Scopus. <https://doi.org/10.1016/j.jbmt.2022.11.001>
- Rapaport, M. H., Schettler, P., Larson, E. R., Edwards, S. A., Dunlop, B. W., Rakofsky, J. J., & Kinkead, B. (2016). Acute Swedish massage monotherapy successfully remediates symptoms of generalized anxiety disorder: A proof-of-concept, randomized controlled study. *Journal of Clinical Psychiatry*, 77(7), e883–e891. Scopus. <https://doi.org/10.4088/JCP.15m10151>
- Rodrigues, L. M., Rocha, C., Ferreira, H., & Silva, H. (2019). Different lasers reveal different skin microcirculatory flowmotion—Data from the wavelet transform analysis of human hindlimb perfusion. *Scientific Reports*, 9(1). Scopus. <https://doi.org/10.1038/s41598-019-53213-2>
- Rodríguez-Mansilla, J., González-Sánchez, B., Torres-Piles, S., Guerrero Martín, J., Jiménez-Palomares, M., & Núñez Bellino, M. (2017). Effects of the application of therapeutic massage in children with cancer: A systematic review. *Revista Latino-Americana de Enfermagem*, 25. Scopus. <https://doi.org/10.1590/1518-8345.1774.2903>
- Rodríguez-Ruiz, Á., Arcos-Azubel, C., Ruiz-Pérez, M., Peinado, F. M., Mundo-López, A., Lara-Ramos, A., Salinas-Asensio, M. D. M., & Artacho-Cordón, F. (2024). The Benefits of an Integral HAMMAM Experience Combining Hydrotherapy and Swedish Massage on Pain, Subjective Well-Being and Quality of Life in Women with Endometriosis-Related Chronic Pelvic Pain: A Randomized Controlled Trial. *Medicina (Lithuania)*, 60(10). Scopus. <https://doi.org/10.3390/medicina60101677>
- Rodríguez-Ruiz, Á., Sierra-Artal, B., Lozano-Lozano, M., & Artacho-Cordón, F. (2025). Impact of Physical Rehabilitation on Endometriosis and Adenomyosis-Related Symptoms: A Systematic Review and Meta-Analysis. *Journal of Clinical Medicine*, 14(23). Scopus. <https://doi.org/10.3390/jcm14238284>
- Rondanelli, M., Fossari, F., Vecchio, V., Gasparri, C., Peroni, G., Spadaccini, D., Riva, A., Petrangolini, G., Iannello, G., Nichetti, M., Infantino, V., & Perna, S. (2020). Clinical trials on pain lowering effect of ginger: A narrative review. *Phytotherapy Research*, 34(11), 2843–2856. Scopus. <https://doi.org/10.1002/ptr.6730>
- Rostron, S. (2021). The effects of massage therapy on a patient with migraines and cervical spondylosis: A case report. *International Journal of Therapeutic Massage and Bodywork: Research, Education, and Practice*, 14(3), 15–21. Scopus. <https://doi.org/10.3822/IJTMB.V14I3.629>
- Stenbäck, V., Lehtonen, I., Mäkelä, K. A., Raza, G. S., Ylinen, V., Valtonen, R., Hamari, T., Walkowiak, J., Tulppo, M., & Herzig, K.-H. (2024). Effect of Single Session of Swedish Massage on Circulating Levels of Interleukin-6 and Insulin-like Growth Factor 1. *International Journal of Molecular Sciences*, 25(17). Scopus. <https://doi.org/10.3390/ijms25179135>
- Wang, T., Zhai, J., Liu, X.-L., Yao, L.-Q., & Tan, J.-Y. (2021). Massage Therapy for Fatigue Management in Breast Cancer Survivors: A Systematic Review and Descriptive Analysis of Randomized Controlled Trials. *Evidence-Based Complementary and Alternative Medicine*, 2021. Scopus. <https://doi.org/10.1155/2021/9967574>
- Wilczyńska, D., Łysak-Radomska, A., Podczarska-Głowacka, M., Zajt, J., Dornowski, M., & Skonieczny, P. (2019). Evaluation of the effectiveness of relaxation in lowering the level of anxiety in young adults – A pilot study. *International Journal of Occupational Medicine and Environmental Health*, 32(6), 817–824. Scopus. <https://doi.org/10.13075/ijomeh.1896.01457>
- Zhang, T., Yan, H.-X., An, Y., Yin, L., Sun, P.-P., Zhao, J.-N., & Yan, J.-T. (2022). The Efficacy and Safety of Manual Therapy for Symptoms Associated with Multiple Sclerosis: A Systematic Review and Meta-Analysis. *Journal of Integrative and Complementary Medicine*, 28(10), 780–790. Scopus. <https://doi.org/10.1089/jicm.2021.0382>