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Impact of Physical Exercise on Menopause Symptoms and Health-related quality of life - a literature review

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ABSTRACT

Menopause, which usually occurs between the ages of 45 and 56, is a natural biological condition that signifies the end of a woman's menstrual cycles. It is formally diagnosed after twelve months without a menstrual period, which indicates the end of ovarian function. Hormone fluctuations, especially a decrease in estrogen and progesterone levels, are a defining feature of the menopausal transition. These hormonal shifts can lead to a range of emotional and physical issues. The most commonly reported symptoms include vasomotor

symptoms such as hot flashes and night sweats, as well as psychological alterations like melancholy, mood swings and disturbed sleep.

Menopausal symptoms can significantly impact a woman's quality of life, and many seek ways to manage or relieve these symptoms. Lifestyle interventions, including regular physical activity, have been shown to be effective in alleviating some of the unpleasant symptoms associated with menopause.

On 15/11/2024, two databases (PubMed and GoogleScholar) were searched using the keywords "menopause" or "menopausal symptoms" and either "physical activity" or "exercise" or "sport". Articles were included if they were published in English between 2020 and 2024, focused on the impact of physical exercise on menopause symptoms and quality of life. Only original research papers were considered. Studies focusing on patients with chronic diseases or oncological history were excluded as well as papers concerning only osteoporosis or urinary dysfunction.

21 studies were included in the review, comprising a total of 3,506 participants. Our review's main conclusions are as follows: Regular physical activity can help reduce menopausal symptoms and enhance quality of life. Resistance Exercise helps with physical and vasomotor symptoms, but it has little effect on cardiovascular health or long-term symptom reduction. Yoga is highly effective in reducing vasomotor, psychosocial, and physical symptoms, with long-term antioxidant benefits but limited effects on hormonal levels (FSH, DHEA-S). Multicomponent Exercise (e.g., team handball, resistance training) offers broad benefits for physical fitness, psychosocial well-being and vasomotor symptoms. Additionally, progressive muscle relaxation improves sleep quality and fatigue.

Keywords: menopause, menopausal symptoms, physical activity, exercise, sport

INTRODUCTION

The menopausal period, sometimes referred to as perimenopause or climacteric, is a time of transition in a woman's life that signifies the end of the reproductive cycle and the cessation of ovarian hormone activity [1]. The term "menopause" refers to the final menstrual cycle, which is followed by a minimum of 12 months without menstruation. On the contrary, perimenopause is the years-long period that precedes menopause, and is characterized by hormonal, clinical and metabolic alterations linked to ovarian function reduction [2]. These changes can cause menstrual cycle disruptions, the severity of which may vary considerably among women.

Menopause typically begins between the ages of 45 and 56 [3]. The ovaries undergo major changes during this period, including an increase in anovulatory cycles, a suppression of ovulation, and a suppression of Graafian follicle maturation, particularly during perimenopause. The ovaries shrink in size as their cortex thins and the corpus luteum becomes dysfunctional due to a decrease in activity [4]. As a result of these hormonal changes, the levels of estrogens, especially 17β -estradiol (E2), inhibin and progesterone, drop due to corpus luteum insufficiency. As the body attempts to stimulate the ovaries to produce hormones, gonadotropin levels, such as those of follicle-stimulating hormone (FSH) and luteinizing hormone (LH), increase concurrently [5]. Moreover, androgens produced by the adrenal glands and ovaries, including testosterone, androstenedione, dehydroepiandrosterone

(DHEA) and dehydroepiandrosterone sulfate (DHEA) are produced at lower levels. Additionally, sex hormone-binding globulin (SHBG) levels change, resulting in increased androgen bioavailability [6]. Vasomotor symptoms represent an early and most commonly occurring manifestation of the menopause period [7,8]. It is estimated that up to 40% of women may experience these symptoms during perimenopause, with the prevalence increasing to up to 80% in the postmenopausal period. [9]. The climacteric syndrome includes thermoregulatory disturbances, somatic symptoms, and psychological changes [10], all of which result from alterations in neurotransmitter distribution in the central nervous system due to the decline in estrogen levels. These symptoms have a neurovegetative origin, meaning that they are caused by changes in the way the hormonal and neurological systems function, and they are most noticeable in the first two years following menopause [11].

The extent and duration of these changes, which are all a part of a woman's natural aging process, might vary considerably based on an individual's lifestyle choices, genetic predispositions, and underlying health conditions [12]. Although many women experience adverse menopause symptoms, a significantly smaller number choose to undergo Hormone Replacement Treatment (HRT) due to its long-term risks [13]. Instead, they are looking for non-pharmacological ways to manage these symptoms and maintain their quality of life. Numerous research has been conducted on the potential benefits of regular exercise and physical activity on the psychological and physical symptoms associated with menopause because it has been shown to improve both mental and musculoskeletal health [14,15].

This review aims to investigate the current research on the relationship between physical activity and menopause symptoms, with a particular emphasis on the types of exercise treatments and the subsequent variations in symptom severity. It also highlights the basic mechanisms through which exercise affects the manifestation of menopause. The primary focus is on how these symptoms impact health-related quality of life (HRQoL).

METHODOLOGY

For this literature review we searched within two databases (PubMed and GoogleScholar) for keywords "menopause" or "menopausal symptoms" and either "physical activity" or "exercise" or "sport" on 15/11/2024. The articles were screened by four reviewers (A.W.; M.SK.; J.S.; J.Sz.) who worked independently at each stage of the process.

INCLUSION AND EXCLUSION CRITERIA

Articles were included if they were in English, published between 2020 and 2024 and assessed physical activity intervention or physical activity measurement in subjects in the menopausal period (with or without controls). Only original papers were included. Studies concerning oncological patients were excluded. Articles only about osteoporosis or urinary dysfunction also were excluded.

DATA EXTRACTION

Data was extracted from the reports with four of the authors (A.W.; M.SK.; J.S.; J.Sz.) independently contributing to the compilation and data extraction. Studies were evaluated for the following information: number of patients, number of participants with Physical Activity (PA) intervention, number of controls, characteristics of women included in the study, intervention type and its duration, menopausal symptom category, evaluated parameters, menopause symptom score, limitations and results (as shown in Table 1 below). No automation tools were utilized, and no additional data were requested from the authors of the included studies.

Table 1.

| study title | nr of participants (n=?) | nr of patients with Physical Activity intervention (n=?) | nr of controls n=? | characteristics of participants | Intervention type | duration | symptom category | menopause symptom score | evaluated parameters | limitations | results |
|--|--|---|---|---|--|-----------------|--|--|--|--|---|
| The effect of diet and exercise on climacteric symptomatology.[16] | n=78 | n=32 | n=46 | perimenopausal women | resistance exercise | 3 months | total, vasomotor, physical, sexual symptoms | modified Kupperman scoring | - menopuse symptoms - modified Kupperman scoring - food imake - diet score | exercise recorded via a WcChat purching form (possible influence on the accuracy of evaluation) no energy or nutrient intakes recorded or analysed | Resistance exercise decreased symptoms like hot flashes, sweating, futigue, muscle pain, and headabes, though other symptoms remained unchanged. Dist and exercise also alleviated bone, joint, and muscle pain, headaches, palpitations, and sexual issues. None intervention improved vertigo. |
| Women's views about physical activity as a treatment for vasomotor menopausal symptoms a qualitative study. [17] | within 261 women n=17 were interviewed | n=12 (Physical Activity- DVD n = 6, Physical Activity- Social-support n = 6) | n=5 | menopausal women, age: 48-57 | regular physical activity | 6 months | vasomotor and general symptoms | subjective opinion | vasomotor menopausal symptoms - semi-structured interviews perceived changes to health attributed to physical activity | subjective opinions of participants only possible influence of prior interest in physical activity on participants' responses | All participants expressed positive views on physical activity as a treatment for menopausal symptons, with most noting improvements in hot flashes and night sweats. They also reported better sleep, physical health, and psychological well-being. |
| Impact of yoga intervention on menopausal symptoms-specific quality of life and changes in hormonal level among menopausal women.[18] | n=80 | n=40 in SKY group (analyzed n=32) | n=40 in brisk walking group (analyzed n=33) | perimenopausal and postmenopausal women, age: 40-50 | group 1: Sudarshan Kriya Yoga (SKY) group 2: brisk walking intervention | 1 year | hormonal changes, quality of life (vasomotor, psychosocial and physical symptoms) | MENQOL tool | physiological parameters: BP, fasting blood sugar (FBS), blood cell count hermonal level: FSH, DHEA-S anticidant enzymes: superoxide dismutase (SOD), glutathione peroxidase (GPX) menopusal quality of life assessment (MENQOL) questionnaire | abscence of control group without any interventions hormone test performed only one time at the end of the intervention | Significant improvements in vasomotor, psychosocial and physical symptoms were observed. Autioxidant enzymes demonstrated a significant elevation after one year of SKY practice compared to walking intervention. However, no significant improvement in FSH and DHE-AS levels was noted. |
| A 16-week multicomponent exercise training program improves menopause-related symptoms in middle-aged women. The FLAM ENCO project randomized control trial. [19] | n=150 (malyzed n=112) | n=75 (analyzed n=59) | n=75 (analyzed n=53) | age: 45-60 | multicomponent exercise training program | 16 weeks | menopause-related symptoms, particularly vasomotor symptoms | The 15-item Cervantes Menopause and Health Subscale | menopums-related symptoms vasomotor symptoms (VMS) couple relationships, sexuality psychological state | relatively small sample size - unable to establish differences by menopausal state serum homone levels not measured white women only - ethnicity not considered | The multicomponent physical exercise program demonstrated a beneficial impact on menopurse symptoms, particularly in the context of couple relationships, prochological well-being, and vasomotor symptoms. |
| Effect of the Information Support Method Combined with Yoga Exercise on the Depression, Anxiety, and Sleep Quality of Menopausal Women.[20] | n=106 | n=52 | n=54 | menopausal women, age: 45-55 | yoga | 24 weeks | menopausal symptoms, depression, anxiety, sleep quality | Kupperman Menopausal Symptom Distress Scale | menopause symptoms - The Kupperman Menopausal Symptom Distress Scale mental health - Self-rating Depression Scale (SDS), Self-rating Amicity Scale (SAS) sleep quality - Pittsburgh Sleep Quality Index (PSQI) | no in-depth investigation of the relationship between the symptoms, usage of subjective scales only | The combination of information support method and yoga exercise has been demonstrated to reduce menopausal symptoms such as depression and anxiety and improve sleep quality with a significant reduction in the Kupperman score. |
| The effect of progressive muscle relaxation exercises on postmenopausal sleep quality and fatigue: a single-blind randomized controlled study.[21] | n=63 | n=31 | n=32 | postmenopausal women | progressive muscle relaxation exercises | 8 weeks | fatigue, sleep quality | not applied | - farigue - Piper Farigue Scale and the Pittsburg - sleep quality - Sleep Quality Index | relatively small sample size | Progressive muscle relaxation exercises have shown a beneficial impact on sleep quality and fatigue. |
| Multicomponent recreational team handball training improves global health status in postmenopausal women at the long term - A randomised controlled trial.[22] | randomised n=71 (analyzed n=45) | n=42 (analyzed n=31) | n=29 (analyzed n=14) | postmenopausal women, age: 65+/-6 | multicomponent exercise training protocol | 36 weeks | cardiovascular, bone, metabolic health, body composition and physical fitness markers | not applied | HE, DAA seams, isometric kare extension peak tonge and mite of there development. (PEO) tests, standardiot trendmill interemental protocol blood samples: metabolic (glacose; insulin, total choleserod, HDL, LDL, TRO) and bone turnover markers (ideorsini, CTA, PINP and physical fitness, references, handping trongh and postnut balance, International Physical Activity Questionnaire | relatively small sample size | A 16-week training intervention resulted in improved VO2peak and aerobic performance, which were maintained at 36 weeks. The 20-week extension of the intervention led to further enhancements in lipid profile and physical fitness variables. |
| Impact of Qigong exercises on the severity of the menopausal symptoms and health-related quality of life: A randomised controlled trial.[23] | randomized n=125 (analyzed n=117) | n=63 (analyzed n=57) | n=62 (analyzed n=60) | postmenopausal women, age >=60 | BaDuanJin Qigong exercise programme | 12 weeks | menopausal symptoms and health-related quality of life (HRQoL) | Menopause Rating Scale (MRS) and the 36-item Short-Form Health Survey (SF- 36) | - menopausal symptoms - Menopause Rating Scale (MRS) - health-related quality of life (HRQoL) - Short-Form Health Survey (SF-36) | only short-term effects were assessed, physical activity level of the control group controlled by telephone calls, possible sinfl-report bias, possible influence of the participants' age on the symptoms improvement, the level of energy expenditure not assessed | The Qigong training program was found to significantly improve both psychological menopausal symptoms and HRQoL scores. |
| Effects of resistance training on quality of life in postmenopausal women with vasomotor symptoms.[24] | randomized n=65 (analyzed n=58) | n=33 (analyzed n=29) | n=32 (analyzed n=29) | postmenopausal women, age: >45 | resistance training | 15 weeks | health-related quality of life (HRQoL), particularly vasomotor symptoms | Women's Health Questionnaire (WHQ) and Short Form Health Survey (SF-36) | menopausal symptoms - Women's Health Questionnaire (WHQ) health-related quality of life (HRQoL) - Short-Form Health Survey (SF-36) | relatively small sample size usage of subjective scales only | The resistance training improved vasornotor symptoms, sleep problems and menstrual symptoms in postmenopausal women from baseline to post intervention. No significant intergroup differences were observed in the SF-36 summary scores. |
| A 2-year follow-up to a randomized controlled trial on resistance training in postmenopausal women: vasomotor symptoms, quality of life and cardiovascular risk markers [25] | n=65 randomized n=35 in a 2-year follow-up | n=33 randomized n=18 in a 2-year follow- up | n=32 randomized n=17 in a 2-year follow-up | postmenopausal women, age: 56 ± 5 | resistance training intervention | 15 weeks | vasomotor symptoms, HRQoL, cardiovascular risk markers | Women's Health Questionnaire (WHQ) and Short Form Health Survey (SF-36) | - cardiovascular risk markers: BP, body arthropometry, blood lipids, ferriña, bionarkers of affarmantion, adipokines, sex hormones, and abdominal fat assessed with MR1 | follow-up of the randomized controlled trial secondary outcome analysis involving only 35 participants, reduced statistical power resulting from participant drop-out, self-reported PM maintenance - possible overestimation | The resistance training intervention was observed to reduce vasemetor symptoms up to six menths post- intervention. However, the effect was not maintained after two years. Yuthenmore, the intervention dil ato contribute to the maintenance of improvements in cardiovascellar this markness of HR00, after two years, in comparison to a control group. |
| Resistance training reduced luteinising hormone levels in postmenopausal women in a substudy of a randomised controlled clinical trial: A clue to how resistance training reduced vasomotor symptoms[26] | n=65 randomized n=56 analyzed | n=33 randomized n=27 analyzed | n=32 randomized n=29 analyzed | postmenopausal women, age: >=45 | resistance training program | 15 weeks | hormone levels | not investigated | - daily number of VMS, BP - blood samples: FSH, LH, teasontrone, SHBG | substudy of the randomized controlled trial blinding not possible not able to detect the genadotropin palsatility dietary habits not measured | The resistance training program resulted in a significant reduction in LH levels. While FSH also demonstrated a decrease, this did not reach statistical significance. |
| Association between physical activity, cardiorespiratory fitness, and body composition with menopausal symptoms in early postmenopausal women.[27] | n=56 | no intervention | no control group | postmenopausal women, age: 50-65 | no intervention | no intervention | somatic, psychological, urogenital, and total menopause symptoms | Menopause Rating Scale questionnaire | monoyance symptom: - Menopunc Rating Solo - physical activity - International Physical Activity Questionnaire - and/ore-pinney filterse - ostimating VO2max - Rockport test - body composition - BMI, waist to hip ratio (WHR) | small number of participants other factors associated with MS (psychological and genetic) not measured | Exercise energy expenditure inversely correlated with menopause symptoms. VO2max and urogenial symptoms are negatively correlated. A positive correlation was found between WHR and somatic menopause symptoms. Siming time was also linked to total, somatic, and psychological menopause symptoms. |
| | | | | | | | | | | | |

| study title | nr of participants (n=?) | nr of patients with Physical Activity intervention (n=?) | | characteristics of participants | | | | menopause symptom score | | | |
|--|-----------------------------|--|------------------|---|---|-----------------|---|---|--|--|--|
| Menopausal symptoms, physical activity level and quality of life of women living in the Mediterranean region.[28] | n=1113 | no intervention | no control group | perimenopausal women, age: 40-60 | no intervention | no intervention | vasemotor, psychosocial, physical and sexual symptoms | The Menopause Specific Quality of Life Questionnaire (MENQOL), The International Physical Activity Questionnaire | - BMI,Waist circumfreence (WC), waist to hip ratio (WHR) | not able to establish the impact of personal variables over time the use of a self-administered instrument to evaluate the PA level | MENQOL subdomain scores were highest among women with the lowest PA level and vice verse (p=0.0 01) (These fullings establish as horeable correlation between PA and midlife women's quality of life and a negative correlation between PA level and the frequency of menopausal symptoms. |
| An Interventional strategy of physical activity promotion for reduction of menopause symptoms.[29] | n=190 | n=95 | a=95 | menopuusal and perimenopuusal women, aga: 40-60 | walking | 12-week | hot flushes, sleep problems and joint problems | The Menopuuse Rating Scale (MRS) | necoporal symptoms - Manopune Rating Scile (MIS) physical activity - International PA Questionnaire (IPAQ) | social records as a key component of the surragy -dim collection based on self-reported questionmains-possible recall bias -net-inversion group di out reason -net-inversion group di out reason -net-inversion group di out reason -net-inversion group di out reason -net-on-possibilite preferenzional group- -net-of-transferenzione bias -neto of bioly muss index (BM), instead of -neto of bioly muss index (BM), instead of bioly muss index | 51.6% of performer experienced severe menopusal spycholin, while 52.5% of periodication were spycholin, while 52.5% of periodication were determined incomparison and symposium version. Additionally, menopusal symposium version. Additionally, menopusal symposium increased with higher severes on the Rob Depression increases, while depression isomes improved as physical activity levels rose. |
| Regular leisure-time physical activity is effective in boosting neurotrophic factors and alleviating menopause symptoms. [30] | n = 52 | n=52 | no control group | obese middle-aged women | stretching, fast walking on a treadmill, mederate-intensity resistance exercises | 12 weeks | depression, menopause symptoms, cognitive function | Korean version of the elimasteric symptom index (MENSI), Conter for Epidemiologic Studies Depression Scale (CES-D), The Attention Function Index | - blood samples: cathepsin B, NGF and BDNF levels | no controls, the frequency of physical activity not specified | Engaging in regular leisure-time physical activity enhanced body composition, cognition, and neurotrophic factor levels, while also helping to roduce menopausal symptoms and depression. |
| The effect of physical activity and depressive mood on menopausal symptoms in postmenopausal women.[31] | n-190 | no intervention | no control group | menopausal woman, age: 40-65 | no intervention | no intervention | vasomotor, somatic psychological urogenital symptoms and depressive symptoms | Menopouse Symptom Rating Scale, International Physical Activity Questionnaire— Short Form and Beck's Depression Inventory | - menopurse symptoms - Menopurse Symptom Rating Scale - physical activity - International Physical Activity Questionnuire— Short Form - menral batht - Bock's Depression Inventory | there was no intervenion | As the level of physical activity increased, it was found that the total scores of MRS total group, psychological and unogenital subdimensions decreased significantly. Also depression symptoms increased as the physical activity scale score decreased |
| The role of physical activity in the link between menopausal status and mental well-heing.[32] | n= 1,098 | so intervention | no control group | age: 47-55 | self-reported exercises (low, medium, and high intensity) | no intervention | vasomotor, somatic or pain symptoms, psychological and urogenital symptoms, depressive symptoms, positive admensitive affectivity | Centre for Epidemiologic Studies Depression Scale, the International Possible and Nogative Affect Schedule Short Form, and the Satisfaction with Life Scale | Attentiation of memoryanal datas - seem FAM - secreptual oppotent - structured quasilonatia - metra backbergs - Carels for Epidemionity is studio Depression State, In International Network and Network Andreas Frem, and the Studio-time with LA Scale - physical actiony - addrepsend | possibility of file events influencing mental well-being out able to control the initial levels of depressive symptoms, the duration of the memprase transition, and exposure to expossible influences in the symptome influence on mestal well-being not fully explored activity associated with a self-export performance on mestal well-being not fully exploring a lacvisity associated with a self-export performance on solito duration and the self-export performance on the systematic and the self-export performance on the systematic and the self-export performance on the systematic and the self-export member of high period self-activity and the self-export member of high period self-exponent individuals | Women with high physical activity had higher positive affectivity, and pro, early peri, and postmenspansal women showed higher life attification and low-depension compared to hose with low activity. Pre and postmenopasal women with medium activity also had higher file satisfaction than their low-activity counterparts. |
| The effect of exercise training based on the health promotion model on menopausal symptoms. [33] | n=156 | n-78 | n-78 | menopausal woman, age: 45-60 | mederate-intensity walking, power exercises, balance exercises, stretching | 12 weeks | depression, anxiety and sleeplessness, vasomotor and urogenital symptoms | Menopouse rating scale (MRS), Health promoting lifestyle profile 1 (HPLP I) | menopouse symptoms - Menopouse rating scale (MRS) lifestyle behaviors - Health-promoting lifestyle profile I (HPLP I) | women from two family health centers only enrolled in the study | Physical exercises based on the health promotion model alleviate menopousal symptoms. |
| Effect of eight weeks of low, moderate, and high-intensity TRX training on hot flashes, mood, fat percentage, and muscular endurance in postmenopausal women.[34] | n~40 | n~30 | n=10 | obese posimenopausal women | low, moderate and high intensity TRX training | 8 weeks | mood, het flashes, fat percentage and muscular endurance | Kupperman Index Questionnaire24 and BRUMS | BMI, body density muscular endurance - modified pull-up test mode BRUMS.25 fair precurange - caliper and 3-point equation of Jackson-Pollock for wareat -merral start - Brunel questionnaire hot fields - Kapemerni index questionnaire | FSH levels not measured | Training intervention significantly improved body composition, mood, and bet flushes. The moderate- intrastity training appeared to be the most effective at reducing fat percentage. However, no significant differences were found across different training intrastities for the other measured outcomes. |
| Effectiveness of SaBang-DolGi Walking Exercise Program on Physical and Mental Health of Menopausal Women.[35] | n~40 | n – 21 | n = 19 | ago: 50–65 | SaBang-DelGi walking exercise | 12 weeks | physical and mental health | physical test and simple mental health test II (Kerea Symptom Checklist- 90 Revision) | physical: skeletal muscle mass, BMI, body fat percentage, waist clearant/neces. big siconafference, prijy strangth, fleshilliny and addormian innecks: strangth. matrizel depression, phobies matricy and gamphabias, skept, stress valuenability and low self-equitation. | small number of participats, short-sem duration of PA intervention | Participation in the Salsmap Doklis wilking program denorch that in the group of post-mesopural warmen BML, body far percentage and waist circumference descrised after exercise and that argin strength, abdottmin musick strength, factobility and their detechant maced music increased. Mesover the research found statistically significant improvement in depression, anxiety, public anxiety, approphibin, skep problems, stress vulnerability and low self- regulation after cercise. |
| Effects of yoga on menopausal symptoms and sleep quality across menopause statuses: A randomized controlled trial.[36] | n=208 | n = 104 | n = 104 | postmenopausal and perimenopausal women, age: 45-60 | home-based yoga program | 20 weeks | menopausal symptoms, sleep quality, social support, depression, anxiety and stress | Menopouse Rating Scale; Pittsburgh Sleep Quality Index; Multidimensional Scale of Perceived Social Support; 21- item Depression, Ambiety, and Stress Scale | menal health - the Depression, Ansiety, and Stress Scale social apport- Multifumstissional State de Perceived Social Support immorpusal symptoms - Menyausz Briting Scale sleep quality - Philosoph Sleep Quality Index | lack of accounting for multiple comparisons - increased chance of false-positive results | The study showed a significant improvement in social support and steep quality in the yoga group as well as a decrease in the severity of menopusal symptoms, stress, depression and anxiety. |

RESULTS

SEARCH RESULTS

A total of 21 studies were included in the review. The initial search identified 316 articles of which 265 didn't meet the inclusion criteria (concerning menopausal symptoms and physical activity, published between 2020-2024, original papers, articles written in English). Twenty-four papers were excluded because the researchers focused exclusively on osteoporosis or urinary dysfunction rather than menopausal symptoms in general. Two studies were excluded because they were not original papers, and another two reports were excluded as they focused on participant motivation rather than physical activity. Additionally, one study was excluded due to the patients' oncological history, and another one was excluded because it had not yet been completed.

The study identification process is illustrated in Fig. 1.

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only



**No automation tools have been used to exclude papers.

Source: Page MJ, et al. BMJ 2021;372:n71. doi: 10.1136/bmj.n71.

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FINDINGS

While some studies concentrate on postmenopausal women (defined as those who have not had a period for a year or longer), others target perimenopausal women (such as those with irregular menstruation or recently erratic cycles). The age range of the subjects spans from 40 to 70 years, with the majority of research concentrating on women in the 45–60 age range. Some studies involve elderly women (60-70) [21,22,23] or younger women (40-45) [18]. The role of obesity and other health issues is not frequently addressed in these studies [30, 34]. The majority of the studies employ some kind of physical activity as the intervention. However, some studies include a control group that does not receive any intervention and is not required to adhere to any kind of fitness regimen [27,28,31]. The intensity of self-reported exercise levels is evaluated by certain programs and classified as low, medium, or high intensity. [29,32].

The majority of interventions are organized programs such as for instance three weekly 60minute sessions [19,20,24,30,33]. The studies differed in the types of physical activity and their effects. The practice of yoga and other mind-body exercises (such as SKY and BaDuanJin Qigong) places an emphasis on flexibility, balance, and mental relaxation [18, 20, 21, 23, 36]. The primary objectives of resistance training are the enhancement of muscle strength and physical conditioning. The objective of aerobic exercise is to improve cardiovascular health and endurance. This can be achieved through activities such as fast walking and treadmill walking. Multicomponent regimens integrate strength, balance, coordination, and aerobic activities [19,22,30,33]. A variety of questionnaires and scales were employed to evaluate menopause symptoms, quality of life, mental health, and physical health. Some topics were addressed through semi-structured interviews, while others were not examined. Evaluations of climacteric symptoms, anxiety, depression, physical activity, sleep quality, and mental health were the main focus.

To assess the severity of menopausal symptoms researchers used Kupperman Menopausal Symptom Distress Scale and Modified Kupperman Scoring as well as Menopause Rating Scale (MRS), The 15-item Cervantes Menopause and Health Subscale and Korean Version of the Climacteric Symptom Index (MENSI).

Quality of Life and Health was evaluated via MENQOL Tool, 36-item Short-Form Health Survey (SF-36), Women's Health Questionnaire (WHQ) and Satisfaction with Life Scale.

To check Mental Health and Psychological Well-Being the researchers utilized Center for Epidemiologic Studies Depression Scale (CES-D), Beck's Depression Inventory, 21-item Depression, Anxiety, and Stress Scale (DASS-21), International Positive and Negative Affect Schedule (I-PANAS-SF), BRUMS – The Brunel Mood Scale and Korea Symptom-Checklist-90-Revision. Furthermore, the Attention Function Index, Pittsburgh Sleep Quality Index (PSQI) and Multidimensional Scale of Perceived Social Support (MSPSS) were employed in the articles. Finally, to determine physical activity levels the researchers utilized the International Physical Activity Questionnaire (IPAQ).

SYMPTOMS

Several studies have explored the impact of physical activity on menopausal symptoms, with a range of exercise interventions demonstrating the potential for beneficial outcomes. Overall, physical activity has been demonstrated to play a protective role in reducing climacteric symptoms and improving quality of life [28]. It has been linked to improvements in hot flushes, night sweats, sleep quality, and overall physical and psychological health [17]. Furthermore, physical activity has also been demonstrated to reduce the severity of both psychological and urogenital menopausal symptoms [31]. Additionally, research has shown that higher levels of physical activity are associated with better mental well-being, including reduced depressive symptoms and improved life satisfaction [32].

Combining yoga with informational support helped alleviate depression, anxiety, and menopause-related distress, as well as improving sleep quality [20]. Progressive muscle relaxation exercises also contributed to better sleep quality and reduced fatigue [21].

Studies on resistance training have shown mixed results. A 15-week program improved vasomotor symptoms, sleep, and menstrual symptoms, but had no impact on SF-36 summary scores [24]. The reduction in vasomotor symptoms was observed to last for up to six months but did not persist long-term. Similarly, while there were improvements in body composition and cardiovascular health, the positive effects on cardiovascular risk markers were not sustained beyond two years [25]. Another study showed that even though this type of training reduced symptoms such as hot flushes, fatigue, and sexual dysfunction, it had no impact on symptoms like vertigo [16] and no significant hormonal changes were observed [26].

Further studies confirmed the positive effects of exercise on menopausal symptoms. A multicomponent exercise program was also found to have a beneficial impact on relationship

dynamics, psychological state, and vasomotor symptoms [19,22], as well as physical exercises based on the health promotion model [33]. The physical fitness markers, including VO2peak, significantly improved over the 16-week period, with sustained benefits observed even after 36 weeks. Additionally, long-term benefits were noted, including improvements in lipid profiles and physical fitness following 20 weeks of training.

Moderate-intensity exercise was found to not only alleviate hot flashes but also significantly reduce body fat percentage and improve mood [34]. Finally, a walking program resulted in reductions in BMI, body fat, waist circumference, and improvements in grip strength, muscle strength, flexibility, and skeletal muscle mass, while also reducing anxiety, depression, and stress vulnerability [35].

HORMONAL CHANGES

Some studies focus on the hormonal changes associated with physical activity, often measuring hormone levels and evaluating their correlation with symptom modifications. In one study, antioxidant enzymes (superoxide dismutase and glutathione peroxidase [GPX]) demonstrated a significant elevation following one year of regular SKY practice, compared to a walking intervention (p < 0.05).

A correlation was observed between the increase in antioxidant activity and improvements in quality of life, particularly in the domains of vasomotor, psychological, and physical complaints. However, there were no obvious fluctuations in the FSH or DHEA-S levels [18]. Another study found that while there was no discernible change in FSH, the LH levels of the compliance intervention group exhibited a significant decrease. Hormonal fluctuations did not correlate with the quantity of vasomotor symptoms [26]. Additionally, increased levels of neurotrophic factors and enhanced body composition have been associated with physical exercise [30].

The presented evidence indicates that physical activity, including yoga, walking, and strength training, has a beneficial effect on menopausal symptoms management. Additionally, exercise has been shown to enhance mood, promote better sleep, and improve quality of life. It has also been demonstrated to reduce vasomotor symptoms, and to have long-term beneficial effects on both mental and physical health.

CONCLUSIONS

In conclusion, it can be stated that menopausal women benefit greatly from any physical activity. Multicomponent and mind-body exercise interventions, including yoga, resistance training and recreational sports are particularly effective when it comes to reducing symptoms such as anxiety, fatigue, and hot flashes, as well as improving overall well-being.

Our findings indicate that an increased amount of activity is associated with better quality of life and fewer menopausal symptoms. An elevated level of exercise has been shown to considerably reduce the incidence of menopausal and depressive symptoms, as well as improve body composition and cognitive function.

DISCLOSURE

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REFERENCES

1) Gatenby C, Simpson P. Menopause: physiology, definitions, and symptoms. Best Pract Amp Res Clin Endocrinol Amp Metab. 2023:101855. doi:10.1016/j.beem.2023.101855

2) Santoro N. Perimenopause: From Research to Practice. J Womens Health (Larchmt). 2016;25(4):332-339. doi:10.1089/jwh.2015.5556

3) Peacock K, Carlson K, Ketvertis KM. Menopause. In: StatPearls. Treasure Island (FL): StatPearls Publishing; December 21, 2023.

4) Sokalska A, Valentin L. Changes in ultrasound morphology of the uterus and ovaries during the menopausal transition and early postmenopause: a 4-year longitudinal study. Ultrasound Obstet Amp Gynecol. 2008;31(2):210-217. doi:10.1002/uog.5241

5) Hall JE. Endocrinology of the Menopause. Endocrinol Metab Clin North Am. 2015;44(3):485-496. doi:10.1016/j.ecl.2015.05.010

6) Brzozowska M, Lewiński A. Changes of androgens levels in menopausal women. Prz Menopauzalny. 2020;19(4):151-154. doi:10.5114/pm.2020.101941

7) Thurston RC, Chang Y, Buysse DJ, Hall MH, Matthews KA. Hot flashes and awakenings among midlife women. Sleep. 2019;42(9):zsz131. doi:10.1093/sleep/zsz131

8) Freeman EW, Sammel MD, Sanders RJ. Risk of long-term hot flashes after natural menopause. Menopause. 2014;21(9):924-932. doi:10.1097/gme.00000000000196

9) Nappi RE, Siddiqui E, Todorova L, Rea C, Gemmen E, Schultz NM. Prevalence and quality-of-life burden of vasomotor symptoms associated with menopause: A European cross-sectional survey. Maturitas. 2022. doi:10.1016/j.maturitas.2022.09.006

10) Kingsberg S, Banks V, Caetano C, et al. Real-world clinical evaluation of natural and induced vasomotor symptoms in the USA and Europe. Climacteric. 2024;27(4):364-372. doi:10.1080/13697137.2024.2340472

11) Morrison JH, Brinton RD, Schmidt PJ, Gore AC. Estrogen, menopause, and the aging brain: how basic neuroscience can inform hormone therapy in women. J Neurosci. 2006;26(41):10332-10348. doi:10.1523/JNEUROSCI.3369-06.2006

12) Gold EB, Colvin A, Avis N i in. Longitudinal Analysis of the Association Between Vasomotor Symptoms and Race/Ethnicity Across the Menopausal Transition: Study of Women's Health Across the Nation. Am J Public Health. 2006;96(7):1226-1235. doi:10.2105/ajph.2005.066936

13) Sarri G, Davies M, Lumsden MA. Diagnosis and management of menopause: summary of NICE guidance. BMJ. 2015;351(12 10):h5746. doi:10.1136/bmj.h5746

14) Global Recommendations on Physical Activity for Health. Geneva: World Health Organization; 2010.

15) National Collaborating Centre for Mental Health (UK). Depression: The Treatment and Management of Depression in Adults (Updated Edition). Leicester (UK): British Psychological Society; 2010.

16) Hao S, Tan S, Li J, et al. The effect of diet and exercise on climacteric symptomatology. Asia Pac J Clin Nutr. 2022;31(3):362-370. doi:10.6133/apjcn.202209_31(3).0004
17) Thomas A, Daley AJ. Women's views about physical activity as a treatment for

vasomotor menopausal symptoms: a qualitative study. BMC Womens Health. 2020;20(1):203. Published 2020 Sep 14. doi:10.1186/s12905-020-01063-w

18) Swain D, Nanda P, Das H. Impact of yoga intervention on menopausal symptoms-specific quality of life and changes in hormonal level among menopausal women. J Obstet Gynaecol Res. 2021;47(10):3669-3676. doi:10.1111/jog.14939

19) Baena-García L, Flor-Alemany M, Marín-Jiménez N, Aranda P, Aparicio VA. A 16-week multicomponent exercise training program improves menopause-related symptoms in middleaged women. The FLAMENCO project randomized control trial. Menopause. 2022;29(5):537-544. Published 2022 May 1. doi:10.1097/GME.000000000001947

20) Lu X, Liu L, Yuan R. Effect of the Information Support Method Combined with Yoga Exercise on the Depression, Anxiety, and Sleep Quality of Menopausal Women. Psychiatr Danub. 2020;32(3-4):380-388. doi:10.24869/psyd.2020.380

21) Sucu C, Çitil ET. The effect of progressive muscle relaxation exercises on postmenopausal sleep quality and fatigue: a single-blind randomized controlled study. Menopause. 2024;31(8):669-678. doi:10.1097/GME.0000000002384

22) Pereira R, Krustrup P, Castagna C, et al. Multicomponent recreational team handball training improves global health status in postmenopausal women at the long term - A randomised controlled trial. Eur J Sport Sci. 2023;23(8):1789-1799. doi:10.1080/17461391.2023.2184725

23) Carcelén-Fraile MDC, Hita-Contreras F, Martínez-Amat A, et al. Impact of Qigong exercises on the severity of the menopausal symptoms and health-related quality of life: A randomised controlled trial. Eur J Sport Sci. 2023;23(4):656-664. doi:10.1080/17461391.2022.2044915

24) Berin E, Hammar M, Lindblom H, Lindh-Åstrand L, Spetz Holm AC. Effects of resistance training on quality of life in postmenopausal women with vasomotor symptoms. Climacteric. 2022;25(3):264-270. doi:10.1080/13697137.2021.1941849

25) Nilsson S, Henriksson M, Hammar M, et al. A 2-year follow-up to a randomized controlled trial on resistance training in postmenopausal women: vasomotor symptoms, quality of life and cardiovascular risk markers. BMC Womens Health. 2024;24(1):511. Published 2024 Sep 13. doi:10.1186/s12905-024-03351-1

26) Nilsson S, Henriksson M, Berin E, Engblom D, Holm AS, Hammar M. Resistance training reduced luteinising hormone levels in postmenopausal women in a substudy of a randomised controlled clinical trial: A clue to how resistance training reduced vasomotor symptoms. PLoS One. 2022;17(5):e0267613. Published 2022 May 26. doi:10.1371/journal.pone.0267613

27) Morardpour F, Koushkie Jahromi M, Fooladchang M, Rezaei R, Sayar Khorasani MR. Association between physical activity, cardiorespiratory fitness, and body composition with menopausal symptoms in early postmenopausal women. Menopause. 2019;27(2):230-237. doi:10.1097/gme.00000000001441

28) El Hajj A, Wardy N, Haidar S i in. Menopausal symptoms, physical activity level and quality of life of women living in the Mediterranean region. PLOS ONE. 2020;15(3):e0230515. doi:10.1371/journal.pone.0230515

29) Javadivala Z, Allahverdipour H, Asghari Jafarabadi M, Emami A. An Interventional strategy of physical activity promotion for reduction of menopause symptoms. Health Promot Perspect. 2020;10(4):383-392. Published 2020 Nov 7. doi:10.34172/hpp.2020.57

30) Kim B, Kang S. Regular Leisure-Time Physical Activity is Effective in Boosting Neurotrophic Factors and Alleviating Menopause Symptoms. International Journal of Environmental Research and Public Health. 2020; 17(22):8624. https://doi.org/10.3390/ijerph17228624

31) Yılmaz S, Arslan I, Yengil Taci D. The effect of physical activity and depressive mood on menopausal symptoms in postmenopausal women. Int J Clin Pract. 2021;75(7). doi:10.1111/ijcp.14247

32) Bondarev D, Sipilä S, Finni T i in. The role of physical activity in the link between menopausal status and mental well-being. Menopause. 2020;27(4):398-409. doi:10.1097/gme.00000000001490

33) Polat F, Aylaz R. The effect of exercise training based on the health promotion model on menopausal symptoms. Perspect Psychiatr Care. 2021. doi:10.1111/ppc.12917

34) Valeh S, Fatolahi H, Azarbayjani MA. Effect of eight weeks of low, moderate, and highintensity TRX training on hot flashes, mood, fat percentage, and muscular endurance in postmenopausal women. Apunt Sports Med. 2020;55(207):97-103. doi:10.1016/j.apunsm.2020.05.004

35) Noh E, Kim J, Kim M, Yi E. Effectiveness of SaBang-DolGi Walking Exercise Program on Physical and Mental Health of Menopausal Women. International Journal of Environmental Research and Public Health. 2020; 17(18):6935. https://doi.org/10.3390/ijerph17186935 36) Susanti HD, Sonko I, Chang PC, Chuang YH, Chung MH. Effects of yoga on menopausal symptoms and sleep quality across menopause statuses: A randomized controlled trial. Nurs Health Sci. 2022;24(2):368-379. doi:10.1111/nhs.12931