

RELATIVE EFFECT OF YOGIC PRACTICE AND PILATES TRAINING ON PHYSIOLOGICAL VARIABLES AMONG WOMEN STUDENTS

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Abstract

Depression and anxiety in women sharply rising Working women have high level of stress than non working women. Increasing amount of work stress at home and work place and its impact on family and home environment can be seen, which affect their emotional, psychological and physical health. The concept of yoga is helpful for reducing anxiety and improving cardio respiratory parameters has created a great interest in the medical research field. The present study was conducted to assessing the effect of yogic exercises and meditation in working women. Yogic session was carried out for 16 weeks. Cardio respiratory parameters (pulse rate, respiratory rate, blood pressure and breath holding time) were measured before and after yoga training. Stress was measured by anxiety score as an indicator of stress, also Visual reaction time as an indicator of cognitive function and finger dexterity score as an indicator of motor skills were measured before and after yoga training. Statistical analysis was done by paired' test It was found that statistically significant improvement in cardio respiratory parameters, anxiety score, visual reaction time and finger dexterity score ($P < 0.05$) after yogic training. Thus, a combined practice of asana, breathing exercises, and meditation & relaxation technique in a sequence is the best available resource to meet the. Present day needs of society. Keywords: Pilates, yoga, health-promoting lifestyle profile, self-reported health status.

Exercise is well documented as having various health benefits. Abundant evidence suggests that regular physical activity is associated with lower obesity rate and cardiovascular disease incidence, better sleep patterns and sexual function, and slower aging-related deterioration of the immune system [12]. Individuals who exercise routinely also tend to report better mood states than those who do not [1]. Indeed, exercise is generally accepted as an integral component of health-promoting behavior, defined as a broad set of lifestyle elements including consuming nutritious foods, maintaining adequate sleep, minimizing stress, and staying away from health-detrimental habits such as smoking-positively related to better health. Most physicians subscribe to the idea that exercise helps mitigate the risk of disease, prevent premature death, and improve the overall quality of life. From a public health standpoint, exercise is one of the most cost-effective means by which public health goals can be attained [3]. The notion that exercise is essential for leading a healthy life, both physically and psychologically, is now indisputable. Among many kinds of physical activity programs, it is noteworthy that Pilates and yoga have gained increasing popularity amongst the general public over the past two decades. Pilates and yoga are particularly appealing due to their direct benefits on physical wellbeing- including weight control and improved posture, flexibility, and cardiovascular function-that come with low risks of sports-related injuries [3]. According to an annual survey conducted by IDEA(International Dance Exercise Association) Fitness Programs and Equipment Survey in 2007, Pilates ranked sixth on the most frequently offered exercise programs, a vast improvement since 1999 [4]. In the same year, yoga also ranked 13th, although its position has undergone gradual declines from its peak in 2002. In annual Fitness Trends Surveys carried out by a United States (US)-based association of Sports Medicine, Pilates and yoga have been frequently listed as Worldwide Fitness Trends since 2008 [5].Evidence of the direct health benefits of Pilates and yoga is growing. For example, some studies showed that regular engagement in Pilates is associated with a boost in functional autonomy, balance, flexibility, and muscle strength [6,7,8,9,10,11,12]. Other studies show that regular yoga participation helped individuals alleviate muscle-related pains, especially among adults with sedentary lifestyles or suffering from chronic illnesses [9,10].

Less known, however, is whether Pilates and yoga may also have secondary, indirect benefits. Adopting a broad set of lifestyle elements that are generally regarded as beneficial to one's physical and psychological health and holding a positive belief about one's health might be

necessary for leading a healthy life. Some prior research hints at the possibility that one form of health-promoting behavior triggers people to adopt broadly health-promoting lifestyle elements (eg, healthy eating, enriching interpersonal relationships, informed health-related decisions, work-life balance, and emphasis on spiritual growth), thereby setting in motion a positive reinforcement loop. For example, Küçük and Livanelioglu (2015) found that individuals starting a clinical Pilates program tend to hold a positive notion about the goodness of exercises and experience an improvement in their sociopsychological aspects of life [11]. Mustian's research team (2013) found that yoga has a positive impact on the sleep quality among cancer survivors [13]. Galasso and colleagues (2020) found that aerobic and anaerobic exercise training was effective in reducing the tendency of binge eating [14].

Nonetheless, these studies come short of providing more comprehensive and clear evidence that Pilates leads to a positive change in the participant's overall health-promoting behavior and self-perceived health status. Furthermore, Küçük and Livanelioglu (2015)'s study primarily targeted people taking a clinical Pilates program, excluding those who might regularly engage in Pilates for nonclinical purposes [11]. Moreover, Pilates was not covered in studies by Mustian et al. (2013) and Galasso et al. (2020). Given this, the current study seeks to fill this deficiency in prior work by directly investigating whether regularly engaging in an exercise program such as Pilates and yoga might positively affect participants' adoption of health-promoting behaviors. Additionally, we examine the extent to which these outcomes shown in program participants are accompanied by an increase in self-perceived physical and mental wellbeing.

In the subsequent sections, we first provide a brief overview of the origins and principles of Pilates and yoga. Next, extending the literature on Pilates and yoga's health benefits, we develop our hypotheses about the relationship between participation in Pilates and yoga on people's health-promoting behavior and subjective perception of wellbeing. In the following sections, we provide a detailed description of our research methods and report our findings. In the final section, we discuss our work's contributions and limitations, with some remarks on our study's practical implications.

The Origins and Principles of Pilates and Yoga Initially called "Contrology", Pilates is a physical fitness system and exercise method developed by Joseph H. Pilates from Germany during World War I [15]. Pilates was initially put together to provide rehabilitation to prison-camp inmates

during the war. When Joseph Pilates immigrated to the US at the close of World War I, he launched a long-term collaboration with dancers and celebrities interested in fitness, which led to many refinements in his earlier exercise methods. During this collaboration, his exercise methods were referred to as Pilates, named after the inventor, Joseph H. Pilates. With the development of a set of assistive equipment, including the Cadillac, Universal Reformer, Chair, Barrel, and Pilates, Pilates is now widely accepted as a useful exercise method for core strength and rehabilitation. The first-generation Pilates trainers, including Lolita San Miguel and Mary Bowen, have actively promoted this novel physical activity method to the general public. Pilates' original principles lie in centering, concentration, control, precision, flow, and breathing [16]. Many Pilates instructors expand from these original principles when developing new applications for training. For example, Pilates Method Alliance (PMA) is a combination of "balanced muscle development", "whole-body movement", and "rhythm as flow", each of which derives from the original set of Pilates outcomes [15]. The Balanced Body Pilates curriculum is primarily a mixture of relaxation and PMA's main principles [17]. With these developments designed to emphasize core training, the Pilates method has ultimately achieved its aim to promote flexibility, endurance, circulation, strength, and body balance. Moreover, Pilates maintains good posture by strengthening lumbopelvic stability, developing muscle tone, protecting the back, and optimizing the spine's alignment through balance.

Rooted in ancient India, yoga has a Sanskrit etymological origin with the meaning of "union". More precisely, yoga refers to the union of mind with the universe's divine. According to Selvalakshmi (2015), yoga purports to liberate a human being from body-mind duality conflicts in every living thing [18]. While yoga gained its early popularity in the Western world, it has gradually established its status as a joint exercise and meditation practice worldwide. Yoga emphasizes harmony among physical, mental, and spiritual elements. Various yoga methods have evolved from their original roots inspired by multiple elements from Hinduism, Buddhism, and Jainism. Among numerous derivative forms of yoga, Hatha yoga is one of the most popular types to date practiced outside India, with its characteristics most akin to physical exercise. Hatha yoga incorporates activities that combine body, mind, and breath. Iyengar yoga, put together by B. K. S. Iyengar, belongs to latha yoga that we focus on in this study [19]. The exercise methods in Iyengar yoga rely on "asana" (poses), in tandem with focused breathing (pranayama) and meditation, to improve flexibility, mobility, stability, and strength and to

facilitate relaxation. Iyengar yoga consists of over 200 classical yoga asanas with 14 different pranayamatypes, ranging from basic to advanced. Students progress gradually from learning simple techniques to building up to more complicated ones.

The Impacts of Pilates and Yoga on Health-Promoting Behavior and Subjective Health Status

Pilates aims to achieve full control of one's behavior through mind-body coordination and fitness, as its original name "Contrology" implies. Similarly, yoga was developed and evolved to achieve the integration of mind, body, and spirit. The PMA guide highlights that Pilates is designed to release stress, aid fatigue recovery, facilitate spiritual rejuvenation, and heighten self-awareness and self-confidence [17]. Yoga practitioners also aim to achieve similar goals [19]. People who practice Pilates or yoga do so not just to increase the amount of their physical activity but also to restore a balance in their hectic everyday lives. So far, extant research supports some of these claims and intuitions [6,7,8,9,10,11,12].

Indeed, a growing body of evidence suggests that regularly practicing Pilates or yoga brings many benefits for the people and their physical, emotional, and psychological wellbeing. Pilates and yoga's health-related benefits range from more tangible ones to more subtle ones. For example, Roh (2016) reported the positive impact of Pilates on positive physical self-description and subjective happiness among Pilates participants [20]. Bullo and colleagues (2015) also reported that Pilates is associated with improved mood states and quality of life among older adults [21]. Mokhtari, Nezakatalhossaini, and Esfarjani (2013) reported similar findings in investigating the health benefits among older adults [22]. Even among healthy individuals, evidence suggests that Pilates is, in general, instrumental in developing dynamic balance, flexibility, and muscle tone [23].

Many published studies also reported similar health benefits of yoga. [24,25,26,27,28]. Selvalakshmi (2015) argued that yoga is an effective therapy in reducing physiological discomforts among postnatal care women [18]. Koo and Shim (2015) found that Zen yoga effectively alleviates sympathetic nerve activation and relieves psychological frustration [24]. Lim and Cheong's study (2012) demonstrated that yoga classes, initiated as part of a community welfare program, proved helpful in reducing anxiety and depression among the lower-income bracket females [25]. In a similar vein, Kim and Kim (2012) reported that yoga and meditation

programs effectively alleviated depression among middle-aged women and positively influenced their social role performance and self-confidence [26].

Despite the increasing popularity of Pilates and yoga among adults who desire to escape from busy and sedentary lifestyles, Pilates and yoga's precise effects on a healthy balance restoration in life are less well known [27,28]. One way to address this question is to directly investigate the effects of Pilates and yoga on the participant's adoption of health-promoting behaviors and subjective wellbeing. If we can establish this relationship, a readily available, low-risk exercise option like Pilates or yoga can be considered a cost-effective way to set such a positively reinforcing cycle toward a healthy life with some confidence. Thus, in an attempt to address this question, the current study examines whether Pilates and yoga participation triggers health-promoting behavior and helps increase their subject health status among the participants.

Health-promoting behaviors refer to the activities geared toward promoting fitness and reducing physical and mental damages. Subjective health status refers to a self-assessment or beliefs about one's health quality. A core assumption underlying these concepts of health-promoting action and subjective health status is that people have a sufficient degree of control over their health-related behavior and that beliefs about their health have some influence on their health-related behavior. Accordingly, we test the following two main hypotheses in this study: Hypothesis 1:

Pilates and yoga groups will show a higher increase in health-promoting behaviors after completing their Pilates and yoga program than the control group.

Hypothesis 2:

Pilates and yoga groups will show a higher increase in subjective health. status after completing their Pilates and yoga program than the control group.

3. Research Method

To test our hypotheses, we designed an experiment where our treatment was Pilates and yoga program intervention, and the two dependent variables of our interest were (1) post-treatment changes in the participants' self-reporting of engagement in health-promoting behaviors (Health-Promoting Lifestyle Profile (HPLP) II) and (2) post-treatment changes in the participants' self-reporting of subjective health status (Health Self-Rating Scale (HSRS)). Our analytical strategy compares pretreatment and post-treatment changes across the three groups, including the Pilates group, the yoga group, and the control group (no exercise group). In October 2017, the first author obtained approval for this experiment in which human subjects were involved from the Institutional Review Board (IRB) of the Korean National Sports University, with which the first author was then affiliated.

HPLP II and HSRS

The Health Promoting Lifestyle Profile (HPLP) is a widely used assessment tool first developed by Walker, Sechrist, and Pender (1987, 1995) [29,30]. In their early work, these researchers focused primarily on developing psychometric scales [29]. Later, the original HPLP was updated to reflect a comprehensive nature of a person's behaviors that has ramifications for their physical and mental fitness and evolved as the HPLP II [31].

HPLP II uses the four-point Likert scale with higher scores indicating greater participation in health-promoting activities and consists of 52 items that can be divided into six component clusters (1) health responsibility, (2) physical activity, (3) nutrition, (4) spiritual growth (or self-actualization), (5) interpersonal relations (or interpersonal support), and (6) stress management [29,30]. Health responsibility captures how a person pays attention to and takes good care of their health on the basis of health professionals' guides. Physical activity is a measure of whether a person does workouts of varying intensity and engages in physical activity of varying kinds and levels. Nutrition captures the extent to which a person consumes appropriate quality and quality foods. Spiritual growth measures the degree to which a person nurtures inner and leads a meaningful life. Interpersonal relations reflect how a person cares about maintaining a meaningful relationship with others and can connect socially and emotionally. Stress management measures the extent to which a person can release their stress and keep stressors in control [30]. The HPLP II has been deployed extensively by researchers interested in the

relationships among these subscales and the impacts of a specific physical activity [31,32,33,34,35,36]. The Health Self-Rating Scale (HSRS) is a comprehensive self-assessment of health quality. IISRS was first developed by Lawton et al. (1982) and has been widely adopted across numerous studies on subjective health status. The HSRS survey asks participants to rate their present health status compared to how it was 1 year prior and how it compares to their friends or colleagues [37,38]. This study adopted a local adaptation of the original IIPLP II and the original IISRS. We relied on Korean translations of IIPLP II and IISRS performed by Seo and Ilah (2004) and Shin and Kim (2009), respectively [36,37,38].

3.2. Intervention Program

Two Pilates and two yoga experts were recruited as instructors for participants to formulate our intervention strategy. Throughout this study, the first author consulted these experts and relevant outside authorities when developing a 1 week pilot program of Pilates and yoga and an 8 week main program to be used as a treatment (intervention) in the experiment. The instructors hired for this study were all fully certified with international licenses. Pilates instructors were certified Balanced Body instructors from the US with more than three years of Pilates class teaching experience. Yoga instructors were also similarly qualified. The intervention implemented in this study consisted of two independent exercise programs, Pilates and yoga. We incorporated activities from the Balanced Body instructor manuals [17]. The Pilates program contained exercises focusing on core strengthening, lumbopelvic stability, and flexibility. All yoga activities were also derived from well-established sources [19]. Our yoga exercises were based on the master of Hatha yoga, yoga Dipika. Similarly, the yoga program contained stretching, flexibility, and strengthening exercises. Table A1 and Table A2 (Appendix A) detail each exercise's purpose in our Pilates and yoga program, with precautions given in the instructor manuals. These exercises had the primary purpose of developing or increasing certain parts of the bodily function. Pilates and yoga group participants took part in their respective class with our trained instructors over the entire 8 week program at the designated location. Pilates typically uses several essential pieces of equipment, such as a Reformer, Chair Barrels, and Trapeze Table, which constitutes the original Pilates apparatus. However, in this study, we decided to focus only on mat-based Pilates to ensure that exercise sessions in Pilates and yoga were similarly formed to minimize the possibility that equipment usage in Pilates might interfere with our experiment as an additional unaccounted variable. Sessions of 1 hour duration were held three times a week for eight weeks at each designated location. Exercise parameters (FITT:

Frequency, Intensity, Time, Type) were as follows (see Table A3 and Table A4 in the Appendix A for details):

Exercise frequency: three times per week;

- Exercise intensity: beginning/intermediate (three sets of six repetitions):

Exercise time: 50 min per session (1 hour session including warm-up and cool-down)

for 9-8 weeks;

- Exercise type: Pilates (mat), yoga.

The Pilates and yoga programs were similar in duration (three 1 h sessions per week for 8 weeks) and technique (both employed mat exercises only). Moreover, the instructors were informed to be careful not to coach participants on the other health-promoting behaviors being assessed. The most distinctive difference between the Pilates and yoga programs was how the exercise programs were conducted. For example, Pilates generally focuses on effective movement and is more likely to utilize dynamic, resistance, and stability-related poses. Yoga focuses typically on strength and flexibility by achieving relaxation and uses more stretching and holding static postures. Pilates instruction also tends to use more verbal explanations, while yoga relies more on demonstration.

Pilot Test

In November 2017, a 4 week pilot test was started with nine people who participated in a 4 week exercise program. Our 4 week pilot study aimed to ensure the appropriate design for our main experiment to be followed. Our focus was to configure the exercise program's adequate task complexity levels in advance of the full-scale experiment to last over 8 weeks. The pilot test subjects were informed that they were participating in a study on a community health program and that their personal information would be kept confidential. Participants were randomly assigned to each of the three groups: a 4 week Pilates program, a 4 week yogaprogram, or a control group with no specified exercise program. During the pilot study, we noticed that some of the exercises we initially included in the program were quite challenging and problematic for

some people. For example, the rollover movement in Pilates turned out to be rather hard for those with no prior exposure to Pilates and yoga. It was crucial to ensure that the exercises included in each program were safe and secure, as well as suitable for beginning and intermediate-level students with no Pilates or yoga experience. Given that people usually have a weak core and unstable lumbopelvic stability, the rollover, inversion movements, and extreme stretching were removed to minimize any injury or accident during the sessions.

Participants

Our inclusion criteria were age 30-49 years, with no severe disease and an interest in yoga and Pilates. Our exclusion criteria were having prior experience with yoga and Pilates and currently participating regularly in exercises such as swimming and regular fitness workouts. The Yoga Community and Korea Pilates Federation assisted recruitment of participants and instructors. In November 2017, the first author contacted and visited the national Pilates Federation and several local yoga communities across South Korea. In meetings with directors of these organizations, the first author explained the purpose of this study. The directors and organizations who agreed to participate in this study assisted in recruiting volunteer participants. Potential participants were identified through these contacts and inquired about their interest and willingness to participate in this study. A sufficient number of people (approximately 100) expressed their desire to participate in our research. Two exercise groups of 30 individuals were randomly selected with a balanced gender ratio for each group. The Pilates and yoga group participated in an 8 week predesigned exercise program. We also needed a control group who would not receive treatment (i.e., no exercise) but would take the two surveys following their instructor's directions. The control group did not participate in any of the specified exercise programs to serve as a baseline comparison for the experiment. Individuals in the control group comprised those who expressed interest in taking a Pilates or yoga class but could not make it for scheduling conflicts. However, they agreed to complete the two surveys at the same 8 week interval as the Pilates and yoga groups. Throughout the 8 week study, we ensured that they did not engage in any other exercise programs during the study period.

Conclusion

From a public health standpoint, it is essential to ensure that people practice a healthy lifestyle with a belief about its positive effect on their health. Such a lifestyle should include a wholistic approach, taking both physical and psychological aspects of wellbeing seriously [12,28,42,43,44]. In this article, we extend prior research suggesting that various elements of health-promoting behaviors can reinforce one another, highlighting and demonstrating the triggering role of exercise such as Pilates and yoga [12,28,42,43,44]. Overall, our results confirm that Pilates and yoga help recruit health-promoting behaviors in participants and engender positive beliefs about their subjective health status, thereby setting a positive reinforcement cycle in motion. By providing clear evidence that the promotion of Pilates or yoga can serve as an effective intervention strategy that helps individuals change behaviors adverse to their health, this study offers practical implications for health care professionals and public health officials alike. Our work sheds further light on the relationship between participation in low-risk and readily accessible exercise programs such as Pilates and yoga and the likelihood that people engage in comprehensive practices for promoting their health.

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