

Spring 5-1-2024

Women in Weights: Contraindications of Cycle Syncing in Osteosarcopenia

Erin Underwood
Indiana State University

Follow this and additional works at: <https://scholars.indianastate.edu/honorsp>

Recommended Citation

Underwood, Erin, "Women in Weights: Contraindications of Cycle Syncing in Osteosarcopenia" (2024).
University Honors College. 23.
<https://scholars.indianastate.edu/honorsp/23>

This Article is brought to you for free and open access by the Honors College at Sycamore Scholars. It has been accepted for inclusion in University Honors College by an authorized administrator of Sycamore Scholars. For more information, please contact dana.swinford@indstate.edu.

Women in Weights: Contraindications of Cycle Syncing in Osteosarcopenia

Erin Underwood

Indiana State University

GH 401 Honors Thesis

Dr. Gregory Bierly and Mr. Matt Bird

April 29, 2024

Abstract:

The purpose of this scientific research was to examine the holistic health practice of women's cycle syncing utilizing an in-depth analysis scope of non-pharmacological practices to prevent osteosarcopenia. Osteosarcopenia is the duplicate diagnosis of osteoporosis, low bone mineral density, and sarcopenia, low muscle mass, co-existing together. Cycle syncing is a media-popularized women's reproductive health practice promoting to balance and regulate hormonal cycles holistically. This practice causes concern for fitness professionals because each menstrual cycle phase is treated differently regarding exercise and nutrition intake, which directly impacts energy levels, hormonal peaks, and overall bodily function in women. The focus of this research examines the exercise component of cycle syncing, and the implications this holistic health program serves compared to use of a consistent resistance training program for the goal of reducing osteosarcopenia in women. Routine weightlifting is an accessible practice to improve bone mineral density and cross-sectional muscle mass in women at any age and from either general or special populations. Considerations for training programs of special populations included women experiencing amenorrhea, post-menopause, or those utilizing hormonal birth control. Peer-reviewed journals, evidence-based fitness practices, and physiological trends were all data considered in use of this research. Concluding findings indicated that consistent weightlifting provided a significantly better practice to prevent osteosarcopenia than cycle syncing did.

Key words: cycle syncing, resistance training, weightlifting, osteosarcopenia, menstrual cycle

Women in Weights: Contraindications of Cycle Syncing in Osteosarcopenia

The image of women in weightlifting is often a stereotypical non-inclusive topic. Stigmas surrounding fitness expectations of gender roles promote gym patrons earning their right to work out if they fit criteria of being a bulky, strong male. Societal expectations place high emphasis on unrealistic body compositions for women that consist of slender and petite appearances. Reinforcing this habitual fitness gap drives women further away from weightlifting, for the fear of becoming “too big, muscular, or powerful and from participating in unfeminine sports...” (Scott-Dixon, 2008). As a result, fitness programs designed for women are advertised to achieve toned and slim bodies. A popular regime in current demand constructs the idea that women should exercise according to their menstrual cycle. Coined cycle-syncing, this term refers to the practice of exercising at different intensity levels to match the four distinct menstrual cycle phases.

Cycle-syncing is a fitness concept first marketed by Alisa Vitti, a health and wellness writer, in 2014. She recommends women perform low-intensity exercise, such as yoga, during strenuous cycle days, and high-intensity training during optimal cycle days. The problematic musculoskeletal concern following cycle-syncing is the deadly development of osteoporosis and sarcopenia, both of which women have a predisposed significantly higher risk for. Osteoporosis is a degenerative skeletal muscle condition meaning “porous bones”, where bones become brittle in a weakened state (NSCA, 2011, p. 14). Bones in the hips and spine are highly susceptible to osteoporosis fractures. Sarcopenia, a progressive muscular system disorder, is characterized by a significant decline in muscle mass and muscular capabilities (NSCA, 2011, p. 81). Together, a comprehensive diagnosis of both conditions is known as osteosarcopenia. Although typically

associated with age-related declines, the detrimental effects of sarcopenia can begin as young as twenty years old. Consistent weightlifting efforts have proven to help women decrease their risk osteoporosis and sarcopenia in a non-pharmacological manner. Weightlifting in this research refers to isotonic, isometric, and isokinetic resistance exercises, such as use of free weights, cables, elastic bands, and weighted machines. My personal experience working as a National Strength and Conditioning Association Certified Personal Trainer makes discussion topic even more imperative in my professional philosophy to educate women about the importance of taking up deserved space in the gym to weightlift. Weightlifting is commonly associated with physique aesthetics, but actually has a great deal of health benefits, beginning with the prevention of such musculoskeletal conditions. Developing degenerative osteosarcopenia is put at a significantly smaller risk when weightlifting is practiced. To fully comprehend the detrimental musculoskeletal effects of cycle-syncing, it is imperative to first examine the four distinct stages of a woman's menstrual cycle and associated hormone levels.

The average menstrual cycle lasts 21 to 35 days and consists of four innate phases. The onset of menstruation begins days 1-7, when the uterine lining is shed. Estrogen and progesterone, hormones that self-regulate a woman's cycle, are at their lowest during this point. Yoga, Pilates, or skipping exercise completely during the duration of menstruation is how a cycle-syncing program would combat significantly low energy levels. A study of 164 recreational female athletes (FRC) reported that 25.9% experienced irritation, headache, fatigue, bloating, and sleeping issues during this period. (Michelekaki et al., 2023). Days 8-13 mark the follicular phase, where the uterus begins promoting new lining proliferation and estrogen significantly increases. With an increase in energy, long-duration cardio, such as swimming and running, is recommended during this phase of cycle-syncing. It was reported that 17.9% of FRC

still reported fatigue and performance disruptions during this phase (Michelekaki et al., 2023). Ovulatory days, 14 and 15, mark the peak of estrogen and testosterone as the ovaries release an egg during this fertile period. High intensity interval training, CrossFit, and kickboxing are the recommended training during this phase of cycle-syncing due to energy levels peaking. Researchers determined 37.8% of FRC athletes reported feeling strong, motivated, and ready to push themselves during their ovulatory days (Michelekaki et al., 2023). The fourth and final cyclical phase occurs during days 15-28. The luteal phase surges progesterone, inducing premenstrual symptoms such as mood swings, fatigue, and bloating before the onset of menses again. FRC linked decline in performance during this phase with anxiety, water retention, sleep pattern changes, and distress (Michelekaki et al., 2023). Cycle syncing clearly follows a feel-good incentive to promoting activity during menstrual phases based on state energy levels. At the cost of increasing risk for osteoporosis and sarcopenia, a consistent weightlifting routine delivers substantially more wellness benefits for women.

The investigative clause within this research is to determine the most optimal weightlifting program for women to prevent osteoporosis and sarcopenia. Cycle syncing completely disregards consistent resistance training, which is vital for increased bone formation and muscular hypertrophy (Papadopoulo et al., 2021). Holistic wellness programs have steered clear of women in weights, opting for exercises claiming to sculp and tone. Cycle syncing promotes this ideology, preventing women from performing progressive overload in weightlifting to become resilient to musculoskeletal stressors. Progressive overload is a weightlifting strategy to promote strength and muscular function, defined as “the gradual increase of stress placed on the body during resistance training” (Kraemer et al., 2002). To answer how this cycle syncing ideology became popular, and more importantly how women can

begin incorporating prioritized weightlifting strategies into their workout regimes, a series of five questions must be answered to negate undesirable physiological effects of following a cycle syncing induced plan.

Research Questions

Who started the idea of cycle syncing and what scientific research is it supported by?

Alissa Vitti, founder of the menstrual tracking app Flo, first popularized the term cycle syncing in 2014 in her book *Woman Code*. Vitti does not possess any professional medical license but has studied nutrition and wellness. Due to her lack of credentials and employing inept medical advice for women globally, the scientific research supporting any idea behind cycle syncing is of utmost priority to first investigate. Research will be done through scientifically peer-reviewed journals, studies, and statements from licensed medical professionals to plant an initial starting point towards disengaging women in cycle syncing.

Why are women physiologically more susceptible to osteoporosis and sarcopenia?

Osteoporosis is four times more likely in women than men and sarcopenia is two times more likely to occur in women than men (Alswat, 2017; Batsis, 2014). The differences in accelerated hormone levels in each gender contribute to musculoskeletal repair and functional capabilities. The purpose of discovering the physiological trigger point behind susceptibility to osteoporosis and sarcopenia will help determine the most optimal training intensity, on average, women can handle at each stage of their menstrual cycle while continuously participating in weightlifting activities.

What physiological factors contribute to significantly greater muscular gains and bone mass in men?

Men have a twenty-four-hour hormonal cycle primarily controlled by testosterone, the primary hormone contributed towards muscular and hypertrophic gains after resistance training (Handelsmen et al., 2018). Researching the precise physiological clock differences between each gender's hormonal cycle will give greater insight into the development of a weightlifting plan curated for women's health. Majority of resistance programs are designed for men and their increased testosterone levels, which is an off-putting and degrading experience for women to not be able to accomplish the same gains as men in identical times. Pinpointing the strategic muscular gain hormonal peaks, and how women can increase their testosterone, will provide insight to the optimum weightlifting regimen that will contribute to increased muscle and bone density mass in all women.

How do post-menopausal or amenorrheic abnormalities impact menstrual cycle trends and energy levels?

Women with atypical menstrual cycles, or absence of a cycle completely, have physiological effects on hormones. A decline in estrogen, FSH, and progesterone have all been associated with these menstrual disorders no matter what stage in life women are in (Dalal and Agrawal, 2015). Determining what causes these abnormalities physiologically will serve as a crucial piece towards research that promotes optimal weightlifting standards that may not align with a typical menstrual cycle.

Does regular use of hormonal birth control contribute to osteoporosis and sarcopenia?

Hormonal birth control, including the mini pill, plastic or copper IUD, depo shot, implant, patch, and vaginal ring are all medical interventions that can completely suppress menstruation and the cyclical phases associated with menstruation (Hillard, 2016). Aside from protection in sexual intercourse, hormonal birth control could also be taken to regulate menstrual symptoms, acne, PCOS complications, or endometriosis alleviation. Due to suppression of a regular menstrual cycle, users will not benefit from cycle syncing because they do not experience the four phases in any instance. Consistent weight training, however, may help decrease the risk of osteoporosis and sarcopenia, which are often complications of hormonal birth control due to the restriction of estrogen and progesterone production. Finding the best weightlifting strategies to combat risk of osteoporosis and sarcopenia in a significantly more vulnerable population is crucial to maintain musculoskeletal health.

Through discovery of these crucial scientific answers, the end-result of compiling the most updated weightlifting regime to combat women's risk of developing osteoporosis and sarcopenia will be accomplished. The unknown fact is currently how to best support women weightlifting during each cyclical menstrual phase. It is known that consistent weightlifting increases muscle mass and bone density, but to approach the fact cautiously and scientifically supported is the most important aspect of any fitness research. All research, infographics, and information regarding this protocol will be sourced from peer-reviewed scientific research that establishes intent in women's training. Deliberately ignoring the consequences of disregarding weightlifting presents with increased risk of osteoporosis and sarcopenia. This research paper is indented to curate a fitness regime that induces muscular strength and hypertrophy in women that is sustainable and adaptable during each menstrual cycle phase.

Projected Considerations for Women in Weights

The difference between men and women in the weight room has been a long-debated concern. Not only can the gym be an intimidating place for women who struggle to build muscle or lift weights compared to the men twice her size, it can be a fearful place for women who are scared to exercise in concern of injuring themselves further. Osteoporosis and sarcopenia, formally known as osteosarcopenia, is a health threat every woman faces with natural aging as sex hormones estrogen and progesterone decline. Pharmacological treatments including sex hormone therapy, extensive medication and supplementation, and extreme lifestyle changes can be overwhelming and often counter intuitive. The all-inclusive non-pharmacological treatment routinely ends up being resistance training. Women who engage in forms of consistent weight training reduce their risk of developing osteosarcopenia and additional chronic diseases. The most important consideration in weightlifting is that it is consistent. Following a cycle syncing approach, lifting weights only during the single week a woman has high energy levels does no good in long-term approaches toward modern fitness healthcare. Routine weightlifting should be adaptative for each woman to accompany the anticipated energy levels during each phase of her cycle, rather than discontinuing the idea of weightlifting completely. Movement is medicine. The discussion presented below represents key considerations both women learning about their hormonal cycles and predisposed health risks should be considering, in addition to certified personal trainers who may be working with special populations of women experiencing chronic conditions. Women need to be lifting weights, and projected solutions to ensure this is possible are utmost priority to create equal representation for women in the fitness field.

Who started the idea of cycle syncing and what scientific research is it supported by?

The concept of cycle syncing is nothing new except in the context it is referred to in fitness and weightlifting. Syncing menstrual cycles in relation to another close woman, such as a mother, sister, or friend has been a studied phenomenon known as menstrual synchrony in a non-deliberate way. Purposefully, some women physically alter their menstrual cycle by following circadian rhythms, biological clocks, diet, and exercise regimens in hopes of improving mood or boosting metabolism. Controlling and altering the menstrual cycle is a common concept researchers have examined for decades. What is new is the scientific reasoning behind following the menstrual cycle, rather than controlling it.

Alissa Vitti, the author of the 2013 book *Woman Code: Perfect Your Cycle, Amplify Your Fertility, Supercharge Your Sex Drive, and Become a Power Source* writes her book to focus on holistic health and healing, trademarking the coined term “cycle syncing”. Vitti is also the founder of Flo Living period tracker app, dietary, and supplementation guide. Despite both her book and online works being highly grossed popular medias amongst women, neither are backed by any medical evidence-based research methods. Vitti does not possess any medical degree. She studied and received a certification from the Integrative Institute of Nutrition, but by FDA and U.S. standard healthcare practices, she is unqualified to diagnose and provide medical advice. Vitti’s cycle syncing approach examines the four stages of a woman’s menstrual cycle: menstrual, follicular, luteal, and ovulation.

Suggesting that women exercise at specific intensities, eat specific foods according to each phase, and “balance” their hormones creates claims of increasing fertility, energy levels, reproductive health, and metabolism (Vitti, 2013). Prior to her publishing’s, Vitti was diagnosed with PCOS (polycystic ovarian syndrome), had uncontrollable acne, and was

unsatisfied with her weight. She used alternative medicine strategies focused entirely on treating each of the four menstrual cycles individually, rather than one true complete cycle. Her personal results were successful, and she decided to trademark the term cycle-syncing to advise other women of her successes. Profits on diet, exercise, and holistic health regimens are targeted towards middle-class women who are interested in achieving and maintaining reproductive health status (Rowe, 2015). The top cause of concern among cycle syncing is that women don't need to be trying to control or follow specific regimens for their reproductive health. The uterus and associated female sex-organs are self-regulating, and the vague hormones in question cannot be "balanced" using any sort of regimen that is not prescribed by a licensed medical professional. Obstetrician Jennifer Lincoln weighed in to state that Vitti is complicating the menstrual cycle to a "silly" and "extreme" extent (Coda, 2021).

The concept of cycle syncing is not medically derived information, nor does it come from a licensed medical advisor, but that does not stop Vitti from continuing to spread the concept of cycle syncing amongst her target population. Vitti regularly engages with her audience, such as appearing on the Dr. Oz show, TedTalk, and utilizes social media platforms to connect. A priority concern amongst the concept of cycle syncing is the vast majority of women are listening to Vitti's advice rather than their specialized obstetrician, gynecologist, or family physician. The purpose of this paper is not to attack Vitti's work, but to spread truthful information about the utmost importance of listening to licensed medical professionals and using trusted guidance that associate with individualized treatment plans. Medicine is such an individualized care and each women has unique menstrual and hormonal needs that no single, broad plan will be complicated enough to serve everyone. Vitti's

website disclaims that the statements made in her work have not been supported by the Food and Drug Administration, but further contradicts this statement by saying her work is supported by respected research (Vitti, 2024).

Vitti also does not elaborate further on the specific research she is referring to, and if it is scientifically derived or peer-reviewed at all. The cause of concern is how readily available this misinformation is to women, especially with the influence of social media and online resources. Misinformation spread from young girls who may just beginning menstruation to middle aged women who are on the cusp of menopause can seriously impact their reproductive and overall physical health in detrimental ways by trying to altercate between cycle syncing. Rather than implementing simple lifestyle changes like resistance exercise and nutrient-dense foods, women are crazed into the unnecessary procedures of cycle syncing. Lincoln further adds that not only to women not need to be individually treating each of their four menstrual cycle phases with specific regimens, but there is also no reason to be following dietary and supplementation advice from any individual that is not a primary care doctor or registered dietician creating an individualized treatment plan (Coda, 2021).

Supplementation, which Flo Living heavily advertises, is not medically necessary for most individuals unless prescribed by a licensed medical professional. More harm than good can be done by taking unnecessary supplementations that can further create reproductive and overall health complications. The use of cycle syncing, and similar business strategies would not only be considered medical malpractice in ethical healthcare concerns if this work came from a licensed medical professional but is also predatory to menstruating women. There is a

niche population of women that cycle syncing targets, but there is no true scientifically derived knowledge that is not based on truthful, good data.

Why are women more susceptible to be diagnosed with osteosarcopenia?

Osteosarcopenia is significantly detrimental to more women than men. In 2010, 5.5 million men were living with osteosarcopenia, compared to 22 million women (Kirk et al., 2020). Brittle bones and weakened muscle are certainly natural courses of aging but can have accelerated effects due to lifestyle factors (i.e., smoking, drinking, drug use), sedentary behavior, genetics, and being a woman. There is a biologically natural decline in bone mineral density (1-1.5% per year), muscle mass (1% per year) and muscle strength (2.5-3% per year) in geriatric individuals (Kirk et al., 2020). Women are still 28% more likely to be diagnosed with osteosarcopenia simply due to hormonal physiological changes than men do not experience (Huang et al., 2023). Post-menopausal women are at the highest risk, with 64.3% of all women aged 64.1 ± 8.9 years diagnosed (Hamad et al., 2019). The prevalence of osteosarcopenia is dependent on four anabolic hormones: progesterone, estrogen, testosterone, and growth hormone. Together, these hormones create anabolic processes in women that contribute to increases in bone mineral density, muscle strength, muscle mass, and overall positive musculoskeletal health. When depleted, such as during and after-menopause, catabolic effects in cytokinetic and osteoblastic activity occur. These processes deplete the musculoskeletal system of anabolic potential and begin a wasting in cyclical nature.

Women are at the highest risk because their weight and BMD are often less than men of the same age, regardless of hormonal changes. Women who have a BMI lower than 20 kg/m^2 are at an increased risk, compared to a BMI between 25 kg/m^2 and 35 kg/m^2 being most

optimal to prevent the risk of bone and muscle degradation (Cheng, 2022). Risk factors can also be conducive with female athlete triad, categorized as osteoporosis, amenorrhea, and disordered eating occurring at once. Amenorrhea occurs when the menstrual cycle becomes absent or irregular due to a hormonal condition a licensed medical professional needs to treat and diagnose. Disordered eating engagement may contribute to insufficient dietary intake regarding calcium, Vitamin D, and protein. These behaviors are associated with women in sports, often attempting to become leaner and change their physical appearance in inconducive manners. Sedentary behaviors and exercise excluding weight training were also found to be significant risk factors as well.

Treatment for osteosarcopenia is focused on maintaining quality of life and slowing the progression of the disease. Resistance training has been a routine common denominator treatment in all musculoskeletal chronic conditions. According to Wolfe's Law, bone adapts to the stressors placed upon it. Purposefully putting weight into the skeletal system and stimulating the creation of new osteoclastic activity enhances the strength of bone mineral density and closes porous openings that can lead to severe osteoporosis. Two to three sets per exercise two to three times per week at 70-80% of 1RM has been studied to improve muscular strength and bone mineral density in a routine resistance training program (NSCA, 2019). Chronic fear of exercise is a common psychological concern amongst women and geriatric patients. Society stigmatizes women in weights, especially young girls, for fear of becoming too muscular and "bulky" if they engage in resistance training. The truth is that unless these girls are engaging in the use of synthetic anabolic steroids and massive dietary growth changes, muscular bulkiness will not be visible. In geriatric populations, perhaps already diagnosed with osteosarcopenia, fear of exercising transitions from appearance to functionality and concerns of further injuries.

Proper weightlifting, under guidance from a certified personal trainer or physical therapist, can enhance musculoskeletal strength and create adaptations that benefit movement capabilities. Both populations including women can benefit from consistent resistance training to combat the chance of developing or progressing osteosarcopenia. Consistency is the key term in these programs, utilizing the NSCA's guidelines as stated above, during every phase of the menstrual cycle. Women who engage in cycle syncing practices are only engaging in proper resistance training for one to one and a half weeks maximum per month. This timeline is inadequate to build proper musculoskeletal adaptations and adhere to Wolfe's Law, which needs consistent resistance practice for up to two months before changes are even noticeable on a BIA or DXA scan. Inversely, cycle syncing can also portray the opposite effects of Wolfe's Law, where the weight demands are too little, and bones become thinner and weaker because there is no intended adaptive use placed upon them. Proper weightlifting exercise is the number one priority for osteosarcopenia populations, whether already diagnosed or with pre-mature risks. Non-pharmacological treatments should be utmost priority, which resistance training exactly provides.

For women already utilizing hormonal birth control or another prescription medication to manage medical diagnoses and reproductive complications, engaging in weightlifting can provide stimulatory musculoskeletal effects, prevent sedentary behaviors, and diminish the potential of any drug-drug interactions that treatments such as sex-hormone therapy may supply. Weightlifting is routinely supported to be the most effective treatment for women experiencing osteosarcopenia and wanting to take preventative measures. Lifestyle changes, including absence of smoking, drug, and alcohol use is also recommended to decrease any drug-stimulant interactions of birth control users. Dietary alterations may also include 800-1000 IU/day of Vitamin D, 1300 mg/day of calcium, and 1.2-1.5 g/kg of protein per bodyweight to ensure

sufficient micronutrient, macronutrient, and vitamin intake (Kirk et al., 2020). The increased risk for women to be diagnosed with osteosarcopenia means that preventative measures such as weightlifting at appropriate intensity and consuming nutrient dense foods during all cycle phases needs to be maintained to ensure a consistent, healthy lifestyle is being properly achieved.

What physiological factors contribute to significantly increased muscular gain and bone density in men?

Due to their anatomical musculoskeletal structure, men on average possess both more muscle and bone density than women. In a sample of 468 men and women, men had significantly more muscle mass and total body mass (38.4% vs 30.6%, respectively) (Janssen et al., 2000). Men also had higher segmental lean analysis in terms of upper and lower body weight than women, with 42.9% upper body and 54.9% lower body compared to that of women at 39.7% upper body and 57.7% lower body (Janssen et al., 2000). The most common and scientifically supported research is the prevalence of increased testosterone in men compared to women. Testosterone, a naturally occurring anabolic sex hormone, is secreted nearly 20 times as much in men beginning at the onset of puberty (Handelsman et al., 2018). Men secrete testosterone on a twenty-four-hour hormonal cycle, compared to that of an average 28-day cycle for women. Men have the “upper hand” at having regular hormones peak at the same time every day. The primary function of testosterone is to stimulate the anabolic effect of protein synthesis, which conveniently involves building muscle and increased bone density during the repair stage. Increased levels of testosterone also inhibit protein degradation, known for catabolic effects that include bone and muscle degradation.

Women have physiologically less testosterone than men, but this does not mean women are not capable to building muscle equivalent to or greater than the average male. After ten weeks of a dedicated resistance training program, 87 college women and men both completed DXA/BIA scans to remeasure any significant changes in muscular strength, size, or power. Exercises were performed twice per week, utilizing three sets near failure of eight to twelve reps. Rest periods were two minutes. This optimal program, especially for women pursuing resistance training, yielded significant results that further increased the muscular capabilities of women. Women gained an average of 11.76% lean muscle mass strength, compared to 11.61% in men. Despite these numbers being nearly identical, this data is statistically significant in supporting the idea that women can gain equally as much muscle as men, just in copious amounts meant to fit their anatomical structures. Being “big boned” and naturally structured larger simply means more muscle mass is typically present, as seen in men.

For women who have shorter statures, muscle growth, strength, size, and power may be the same percentage amount but shown and presented in different aspects to fit the anatomical structure of each woman’s body. These percentage successes should not discredit women in weights because the amount of muscle pronounced can be equivalently translated to the success a man would experience if he had a smaller anatomical frame like women do. A secondary study examined the complications of bone mass and the supportive cross-sectional area available to even support new muscle. Estrogen and progesterone decline in late-aged women leads to negative bone balance in basic multicellular units (Seeman, 2003). Less and porous bone puts unnecessary maladaptive stress on the musculoskeletal system focused on repair, rather than hypertrophy and strength increases. Consistent weightlifting has been proven to increase circulatory levels of testosterone in women by up to 16.7% in

women and 21.6% in men. The stronger an individual is and the more muscle they physically possess, the higher testosterone levels and more muscle they continue to grow.

The percentage differences once again come down to gaining muscle and strength based on the anatomical structure of an individual's body, accounting for height and weight, rather than comparing to statistical trends that are only based on gender and age. The unique fitness capabilities of men and women will be different for each individual and cannot be relatively compared when each body is uniquely different. In order to combat these musculoskeletal differences, the treatment regimen once again comes down to women in weights. Routine weightlifting creates muscular adaptations that increase muscular size and strength. Muscular hypertrophy is defined as an increase in muscle cell size. This is an important note because muscular hypertrophy is not equivalent to muscular strength. Muscles can be gross in size, but extremely weak and unfunctional. Bodybuilders and gym-aesthetic dependent athletes focus on increasing muscle size without building functional, moveable bodies. The goal of strength training for all individuals should be focused on functional movements that mimic daily life, provide muscular adaptations, and challenge the athlete without being too difficult.

The idea of building better muscle boils down to increasing both Type I, Type IIa, and Type IIx muscle fibers in women participating in weightlifting regimens. Type I fibers are the slow-twitch fibers most abundant in supporting posture, running long distances, and any activity that requires muscle to be turned "on" for long periods of time. The goal of building fast-twitch Type IIa and Type IIx muscles during resistance training equates to training at higher intensities that women might not be experiencing in their daily lives outside of the gym. Effective intensity is recommended to be 60-85% of 1RM, aiming for three to four sets

of eight to twelve reps (ISSA, 2023). The key with these reps is that women should be taking them to muscular failure, where the muscle is unable to contract and produce anymore force until total exhaust. Having consistent amounts of all three muscle types equates to functional, capable, muscle. There is no finite way to completely close the musculoskeletal gap in an even and physiologically capable way. However, women who do weightlift close these differences in a manner unique to their own individualized bodies and challenge their muscular system in a designated way healthy to each woman.

How do post-menopausal or amenorrheic abnormalities impact menstrual cycle trends and energy levels?

Discussing trends amongst weightlifting regarding hormonal changes related to muscular strength and hypertrophy, and the prevalence of osteosarcopenia among women, is naturally due to hormonal changes associated with a natural menstrual cycle. In simple terms covered above, men have higher levels of testosterone run in a cyclical trend regulated over twenty-four hours, rising, and peaking at the same time. Women run on an average twenty-eight-day hormonal cycle, meaning that each day, hormonal levels are different and there is no normal range per diem. For post-menopausal and amenorrheic women, there truly is no “normal”. Examining these two groups of women grants fitness researchers and cycle syncing women a greater insight as to why cycle syncing should not be followed by anyone, even those who need to “regulate” and “balance” their hormones. Following progressive overload in a weightlifting regimen anticipates increasing weight or reps during each gym session, and is the most optimal protocol for increasing strength, bone density, and muscular size for osteosarcopenia populations.

Weightlifting programs do not anticipate for the hormonal changes in women, though, and different energy levels could very well possibly vary each session. Despite this, cycle syncing should not be followed. Weightlifting programs should be built around catering to post-menopausal and amenorrheic populations that provide adequate training stimuli at a challenging yet tolerable level. The latter, completely excusing cycle syncing except for one week per month, followed on a cycle syncing program should not be followed to the musculoskeletal damage as mentioned on the sections above. Post-menopausal women hormonal changes and energy levels will be examined in this research section first. During menopause, the ovaries completely stop producing potential ovum and the uterus is no longer physiologically capable of producing an environment for oocyte maturation. Progesterone and estrogen decline significantly and begin to taper off into geriatric years, hormone levels stay consistently low because there is no significant menstrual cycle phase to be followed.

Natural menopause is also associated with reduced energy expenditure, resonating with lower basal metabolic rates (BMR) and total energy expenditures (TEE). In a cross-sectional study of 300 women, 85.3% of post-menopausal women reported extreme chronic fatigue (Taylor-Swanson et al., 2019). Perceived stress level may be elevated, and libido may decrease, in addition to fatigue. Night sweats are also a protentional symptom of menopause, interrupting sleep cycles and leading to fatigue in a sleep deprived manner. In either case, post-menopausal women have no reason to entertain the idea of cycle syncing because they no longer have a normal menstrual cycle. What they do now have is a population wide risk of developing osteosarcopenia, due to depleted hormone levels. These depleted levels of estrogen and progesterone are the main cause of concern for low muscle mass, low bone mass, and low energy levels. Women in a post-menopausal phase should focus on resistance training exercises that

prioritize maintaining muscle and bone mass, and strength, while slowing the progression of detrimental delay. Working with daily energy levels is the appropriate concern in weightlifting, rather than completely disregarding its importance in the post-menopausal population.

Younger women are at a higher risk for amenorrhea, which disrupts the hormonal cycle and energy levels in women in a slightly different way. 17.4 million women aged 18-44 experience some form of functional hypothalamic amenorrhea (Shufelt, 2017). Amenorrheic women may have late, absent, or irregular menstrual cycles, which also significantly impacts hormonal changes that cycle syncing claims to follow. Unlike typical menstruation and post-menopausal changes which focus on progesterone and estrogen, the unpredictable phases of amenorrhea can be attributed to the suppression of gonadotropin releasing hormone, which decreases the levels of follicle stimulating hormone and luteinizing hormone. Diagnoses of any amenorrhea condition must be utilized using the following criteria of at least three months of applicable hormonal levels: estrogen <50 pg/ml, FSH <10 mIU/ml, and LH <10 mIU/ml (Shufelt, 2017). Amenorrheic women are most likely to suffer from psychological conditions impacting mood, including depression, anxiety, anorexia-nervosa, and binge-eating disorder. Fluctuation of dopamine is consistent with the idea that mood neurotransmitters are not properly regulated either in amenorrheic patients.

Unintentionally or not, female athlete triad is also a serious complication that is prevalent from young women to Olympic competitors. Composed of menstrual irregularities, disordered eating, and low bone mineral density, women suffer from female athlete triad in their sport and daily life settings. The most common cause of fatigue amongst these active women is insufficient nutrition intake, particularly in carbohydrate consumption. Even those not formally diagnosed

with an eating disorder may under consume food and not take in enough energy without even realizing it. As a result, amenorrheic women have significantly lower energy levels. Among a study of high school athletes, 54% reported menstrual abnormalities, 16% had low bone mineral density, and 36% had low energy levels (Skorseth, 2020). It would be unreasonable for women experiencing any three of these combination diagnoses to properly participate in an active weight training program with high performance, so the first focus should be on treating and ruling out any other definitive diagnoses. For post-menopausal and amenorrheic women, the goal is to engage in consistent weightlifting to further prevent the progression of musculoskeletal degeneration. Key training aspects focus on working with daily energy levels and adapting training level to meet that threshold adequately, rather than substituting it with low-impact and non-weight bearing exercise.

Does regular use of hormonal birth control contribute to osteoporosis and sarcopenia?

The link between prolonged use of hormonal contraceptives in women and osteosarcopenia had been a consistent debate between the pharmaceutical and fitness realms. Nearly 42.5% of women aged 15-49 use some form of female contraceptive (CDC, 2023). Women use hormonal birth control not only for safe sex practices, but also for menstruation regulation, endometriosis, acne, and decreasing risk of ovarian or uterine cancers. The most common type is a daily oral contraceptive pill, either the combination-pill containing both synthetic estrogen and progesterone, or the mini-pill containing only progesterone. Depo-Provera is an injectable form of birth control that women have to get implanted every twelve to thirteen weeks, which releases minimal amounts of progesterone. Similarly, Nexaplanon is an injectable implant that also releases minimal amounts of progesterone but lasts longer at about three years. These

contraceptive methods deliver synthetic hormones to the bloodstream and typically have a higher active ingredient dose because the uterus is not targeted directly. These medications have to travel through the bloodstream, before directly impacting hormonal organs including the uterus, hypothalamus, and pituitary gland (PBS, 2024). The IUD (intrauterine device) is a T-shaped device inserted into the uterus that releases micro-dosed amounts of progesterone. The patch is a topical bandage that releases both estrogen and progesterone into the blood stream, applied for three weeks at a time. The IUD is the only form of hormonal birth control that has diminished bloodstream levels of progesterone and estrogen because it delivers sex hormones directly to the site of action, the uterus. The common denominator of these synthetic hormone pumps is that they prevent ovulation and embryo implantation in the uterus through a negative feedback system.

Elevated levels of estrogen suppress the role of follicle stimulating hormone, and progesterone on luteinizing hormone. Combined, the roles of these two hormones prevent ovulation and the cycle of an ovum being released at all. There are no true menstrual, follicular, luteal, and ovulation phases for women using hormonal contraceptives. The advantages to prescribing a combination of estrogen and progesterone completely inhibit ovulation and thicken cervical mucus, whereas progesterone-dependent options only thicken cervical mucus and thin womb lining so sperm cannot pass through. Mini-pill and progesterone-dependent contraceptives alone cannot inhibit ovulation, making them slightly less effective. Prolonged use of suppressing the natural hormonal cycle can lead to imbalances among anabolic hormones that contribute to increased muscle mass and bone density. A 24-month study examining women on hormonal contraceptives versus those who did not take them revealed the control group (not using contraceptives) had greater lean muscle mass and bone mineral density. The end of the research

revealed cross-sectional muscle area was $4.98 \pm 2.29\%$ and total bone mineral density was $2.07 \pm 2.09\%$ (Burr et al., 2000). Another important note revealed the fracture index of the control group was $8.03 \pm 2.03\%$ (Burr et al., 2000). These statistics are interpreted to support the idea that women not utilizing synthetic hormones are less likely to experience osteoporosis and sarcopenia than those who do.

In a secondary study, muscle biopsies were taken prior to and after a twelve-week resistance training program in women using contraceptives versus not to examine muscular strength and hypertrophy. Cross-sectional muscle area increased significantly in the non-contraceptive use group by $7.9 \pm 0.09\%$, and in 1RM max strength by $15.4 \pm 1.6\%$ (Dalgaard et al., 2019). In the Depo-Provera shot, only progesterone slowly released actually causes a decline in estrogen levels over time. In research presented to negative Depo-Provera effects, a subjective group of women 18+ who had been using this contraceptive for at least six years had their bone mineral density examined with a DXA scan. Bone mineral density in the spine and hip had been reduced by 5-6% below baseline for age average and decreased the most within the first two years of using Depo (Woolorton, 2005). Additionally, women aged 12-18 also experienced overall bone loss by 4-6.9% after an average of 4.6 years of Depo usage (Woolorton, 2005). The natural surge and rise of estrogen and progesterone, rather than a consistent level, has been routinely proven to impair bone mineral density, muscular hypertrophy, and muscular strength. Ethical implications and medical contraindications arise in the concept of hormonal contraceptives because it is not feasible for women to completely discontinue use all together.

It is also not practical to be getting routine BIA or DXA scans to measure bone mineral density and lean muscle mass at an annual rate to determine hormonal contraceptive changes.

What is feasible is implementing lifestyle interventions that will slow the progression of osteosarcopenia in women who utilize contraceptives. Two to three sets per exercise two to three times per week at 70-80% of 1RM has been studied to improve muscular strength and bone mineral density in a routine resistance training program (NSCA, 2019). Lifestyle changes, including absence of smoking, drug, and alcohol use is also recommended to decrease any drug-stimulant interactions of birth control users. Dietary alterations include 800-1000 IU/day of Vitamin D, 1300 mg/day of calcium, and 1.2-1.5 g/kg of protein per bodyweight is also vital (Kirk et al., 2020). Especially for elite athletes and women looking to gain significant muscle mass (e.g., powerlifting or body building), hormonal birth control can significantly inhibit musculoskeletal progressions. Symptoms associated with taking contraceptives can also include blood clots, bloating, mood changes, nausea, breast tenderness, weight gain, and tiredness amongst others. Proper considerations must be examined before committing to a birth control option in order to slow the detrimental effects of osteosarcopenia.

Conclusion

Through extensive research in cycle syncing, the diagnosis of osteosarcopenia in women of all ages has been routinely proven to be preventable with weightlifting. Consistent resistance exercise increases bone mineral density, muscle mass, and overall musculoskeletal health. The purpose of this research was to determine the most optimal exercise program for women who are menstruating, post-menopausal, and using various forms of birth control. Cycle syncing was determined to be a non-evidence-based practice that is not an accessible healthcare format fit to serve general and special populations of women with any benefit. Cycle syncing is also not an accessible practice to women experiencing menopause, amenorrhea, or users of hormonal birth control. The general practice behind this idea is to “balance” and “regulate” hormone levels. For

women already with the absence of menstruation or additional irregularities and an inconsistent hormonal flow, this is not feasible. The popularization of cycle syncing through media has grown predominately amongst young women aged 15-35, in which it is crucial at these ages to begin taking steps to minimize their risk of developing osteosarcopenia. The ultimatum discovered in this research is that women need to be lifting weights consistently during every phase of their menstrual cycle.

The findings among this research answered all proposed questions with scientific based evidence supporting the physiology of women's hormone cycles. It was determined that women's hormones, especially estrogen and progesterone, fluctuate on a daily basis, both peaking and depleting for week times, during specific menstrual cycle phases. This in turn depletes available energy levels depending on cyclical phases and which hormones are peaking at any given time. After menopause, estrogen and progesterone are permanently depleted. These two anabolic hormones contribute to bone mineral density and cross-sectional muscle mass, so when low for permanent time periods, women are at a higher risk for osteosarcopenia. Men are not as likely to be diagnosed with osteosarcopenia because the male hormone cycle fluctuates on a twenty-four-hour basis, compared to the 28-to-31-day cycle women's hormones cycle amongst. The reliance on progesterone and estrogen is significantly inhibited in the men's hormone cycle, too. Testosterone is hormone that creates a physiological advantage to build bone mineral density and muscle mass in men in a significantly quicker time span than women. The prevalence of examining hormonal cycles for both men and women provided piecing answers for all five research questions.

The fundamental concern with participating in cycle syncing is that it does not allow for consistent weightlifting. Progressive overload and Wolffe's Law are not capable of being

achieved when cycle syncing encourages women to lift weights around one week out of every cycle month. Vitti's holistic health campaign focuses on only performing exercises in accordance with state energy levels and predicted cycle phases. There is nothing wrong with performing the suggested yoga, Pilates, or cardio session when appropriately paired with resistance training. When low-impact workouts and sedentary behaviors become all that is being performed, evaluation of an appropriate weightlifting program needs to be examined thoroughly to curate sustained engagement. To decrease the risk of developing osteosarcopenia, engaging in weightlifting during all cycle phases has been proven to be the main outcome goal of all resistance training programs. The most optimal programming has been stated to be two to four sets of resistance training at 60-85% of 1RM, aiming for a minimum of two complete sessions per week. This is a level appropriate guideline for novice, intermediate, and advanced weightlifters looking to improve general strength, mobility, bone mineral density, and cross-sectional muscle mass in women with hormonal levels and menstrual cycles medically considered typical within range.

Special considerations must be made in weightlifting for women utilizing hormonal birth control, experiencing amenorrhea, or those who are post-menopausal. Higher risks of osteosarcopenia are present in these populations when estrogen and progesterone deficiencies are present. Female-athlete triad, PCOS, increased fatigue, stress, bloating, nausea, fatigue, headaches, and sleep disruptions can all be common symptoms these populations of women regularly experience. In any scenario, weightlifting can still be appropriately performed when specific training techniques are considered. Besides adjusting RPE or max percentage effort on the lower end of 60%, training load can be decreased, sets and reps can be increased, and time under tension can be put at a maximum. During any menstrual cycle phase, energy levels may

fluctuate, but the effort put into weightlifting can also fluctuate with each woman in her individualized patterns, too. Accommodations in training are widely available and should be utilized more frequently in women's programming rather than skipping lifting weights completely.

The implication of cycle syncing in a fitness evidence-based practice needs to be nonexistent. It has no proven benefits and can even cause harm to the musculoskeletal system when followed for risk of developing osteosarcopenia. Certified fitness professionals need to be pushing women in weightlifting to reduce the gender influenced stigmas regarding gym culture. Every woman deserves a space in the gym, and she should utilize that space to follow a consistent resistance program to singlehandedly defeat osteosarcopenia. Holistic health professionals, such as Vitti, might view this disciplined approach towards increased weightlifting as counter intuitive because of the significant demands placed on both the musculoskeletal system and reproductive system. As long as weightlifters, fitness professionals, and coaches are effectively communicating in regard to energy levels and state moods, weightlifting has been routinely proven to be a safe and efficient non-pharmacological approach towards combatting osteosarcopenia. The research determined can be applied not only to fitness industry professionals, but also medical providers considered with osteosarcopenia, including physical therapists, rheumatologists, orthopedists, and practicing physicians. Women in weights symbolizes building resilient bodies based upon training practices that are effectively designed to defeat osteosarcopenia, one barbell at a time.

References

- Agostini, D., Donati Zeppa, S., Lucertini, F., Annibalini, G., Gervasi, M., Ferri Marini, C., Piccoli, G., Stocchi, V., Barbieri, E., & Sestili, P. (2018). *Muscle and Bone Health in postmenopausal women: Role of protein and vitamin D supplementation combined with exercise training*. MDPI. <https://www.mdpi.com/2072-6643/10/8/1103>
- Alswat, K. (2017) *Gender Disparities in Osteoporosis*. J Clin Med Res. PubMed. <https://pubmed.ncbi.nlm.nih.gov/28392857/>
- Centers for Disease Control and Prevention. (2023). *Contraception*. Centers for Disease Control and Prevention. <https://www.cdc.gov/reproductivehealth/contraception/index.htm>
- Coburn, J. W., & Malek, M. H. (2011, October 27). *NSCA's Essentials of Personal Training*. <https://www.amazon.com/Essentials-Personal-National-Conditioning-Association/dp/0736084150>
- Divaris, E., Anagnostis, P., Gkekas, N. K., Koudi, E., & Goulis, D. G. (2023, June 7). *Early menopause and premature ovarian insufficiency may increase the risk of sarcopenia: A systematic review and meta-analysis*. Maturitas. <https://www.sciencedirect.com/science/article/abs/pii/S0378512223003766>
- Geraci, A., Calvani, R., Ferri, E., Marzetti, E., Arosio, B., & Cesari, M. (2021, May 5). *Sarcopenia and menopause: The role of estradiol*. Frontiers. <https://www.frontiersin.org/journals/endocrinology/articles/10.3389/fendo.2021.682012/full>
- Handelsman, D., Hirschberg, A., Bermon, S (2018). *Circulating Testosterone as the Hormonal Basis of Sex Differences in Athletic Performance*. PubMed. <https://pubmed.ncbi.nlm.nih.gov/30010735/>
- ISSA. (2022). *How to structure a gym workout for optimal results*. <https://www.issaonline.com/blog/post/how-to-structure-a-gym-workout-for-optimal-results>
- Janssen, I., Heymsfield, B., Wang Z., Ross, R. (2000). *Skeletal muscle mass and distribution in 468 men and women aged 18-88 yr*. Journal of Applied Physiology. PubMed.
- Kraemer, W., Ratamess, N., & French, D. (2002). *Resistance training for Health and Performance*. Current sports medicine reports. <https://pubmed.ncbi.nlm.nih.gov/12831709/>
- Michelekaki, E. A., Michaelides, M., Govindasamy, K., & Parpa, K. (2023). *Recreational Female Athletes' understanding of and perceived impact of the menstrual cycle on physical performance, mood, and sleeping behaviour*. MDPI. <https://www.mdpi.com/2673-4184/3/3/34>

- Moghadasi, M., & Siavashpour, S. (2012). *The effect of 12 weeks of resistance training on hormones of bone formation in young sedentary women - european journal of applied physiology*. SpringerLink. <https://link.springer.com/article/10.1007/s00421-012-2410-0>
- Nichols, D. L., Sanborn, C. F., & Love, A. M. (2002). *Resistance training and bone mineral density in adolescent females*. The Journal of Pediatrics. <https://www.sciencedirect.com/science/article/pii/S002234760157482X>
- Papadopoulou, S., Papadimitriou, K., Voulgaridou, G., Georgaki, E., Tsofidou, E., Zantidou, O., Papandreou, D. (2021) *Exercise and Nutrition Impact on Osteoporosis and Sarcopenia-The Incidence of Osteosarcopenia: A Narrative Review*. Nutrients. <https://pubmed.ncbi.nlm.nih.gov/34960050/>
- Pruitt, L. A., Taaffe, D. R., & Marcus, R. (1995, November 1). *Effects of a one-year high-intensity versus low-intensity resistance training program on bone mineral density in older women*. OUP Academic. <https://academic.oup.com/jbmr/article/10/11/1788/7500851>
- Public Broadcasting Service. (2024). *How the pill works*. PBS. <https://www.pbs.org/wgbh/americanexperience/features/pill-how-pill-works/>
- Scott-Dixon, K. (2008). *Big girls don't cry: Fitness, fatness, and the production of feminist knowledge*. Sociology Of Sport Journal, 25(1), 22-47.
- Shufelt, C. L., Torbati, T., & Dutra, E. (2017). *Hypothalamic amenorrhea and the long-term health consequences*. Seminars in reproductive medicine. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6374026/>
- Thompson, B., Almarjawi, A., Sculley, D., & Jonge, X. J. de. (2019). *The effect of the menstrual cycle and oral contraceptives on acute responses and chronic adaptations to resistance training: A systematic review of the literature - sports medicine*. SpringerLink. <https://link.springer.com/article/10.1007/s40279-019-01219-1>
- Troy, K. L., Mancuso, M. E., Butler, T. A., & Johnson, J. E. (2018). *Exercise early and often: Effects of physical activity and exercise on women's Bone Health*. MDPI. <https://www.mdpi.com/1660-4601/15/5/878>
- Wooltorton E. (2005). *Medroxyprogesterone acetate (Depo-Provera) and bone mineral density loss*. CMAJ. PubMed.
- Yu, Q., & Meng-Xia, J. (2015). *Primary osteoporosis in postmenopausal women*. Science Direct. <https://www.sciencedirect.com/science/article/pii/S2095882X15000079>