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A Literature Review on Exercise is Medicine Initiative

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ABSTRACT

This essay provides a comprehensive review of academic discussions surrounding the Exercise is Medicine (EiM) initiative. It begins by introducing the initiative and overviewing the history of exercise as a form of medicine. This use of exercise goes back to the earliest days of civilization and has developed immensely over the last thousands of years. Subsequently, the essay covers arguments to support EiM, emphasizing the positive aspects of connecting the physical education and medical fields. These arguments in favor encompass a range of perspectives, including but not limited to ethical, evolutionary, medical, biological, and cognitive viewpoints. Additionally, the essay examines opposing arguments from EiM critics, which mainly center on barriers, flaws, and implementation limitations. To conclude, the essay explores potential refutations to EiM critics, helping to identify potential avenues for advancing the initiative.

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Chapter 1

History of Exercise is Medicine

The phrase ‘exercise is medicine’ is omnipresent in academic circles and among exercise enthusiasts. In fact, one of the most prominent exercise-centered efforts to promote health is the Exercise is Medicine (EiM) initiative. The goal of this movement is “to make physical activity assessment and exercise prescription a standard part of the disease prevention and treatment paradigm for all patients” (Sallis, 2009, p. 3). However, the view of exercise¹ as medicine influenced notions of health and healthcare practices before EiM was even considered. Over two thousand years ago, Susruta was the first documented physician to prescribe exercise. In 600 B.C., the Indus Valley physician declared that exercise “should be taken every day...only to half extent of his capacity” (Tipton, 2013, p. 110). He believed that moderate exercise helps maintain health and enhance the body. Aside from acknowledging the benefits of exercise, Susruta was concerned about its potential negative consequences. Specifically, his concern related to excessive exercise. In his opinion, strenuous physical activity could “cause multiple diseases and potentially lead to death” (Tipton, 2013, p. 110).

For many years, this pattern continued. Physicians believed that exercise was necessary to maintain health, but that excessive exercise was harmful. Around 200 B.C., Indian physician Caraka held views similar to Susruta’s. In the centuries leading to Caraka, sacred texts widely accepting the tridosa doctrine transformed the Indus River civilization. The implications of this doctrine were that “1) dosas controlled all functions of the body, 2) diseases occurred when a

¹ Physical activity is all bodily movements produced by skeletal muscles that exert energy (Caspersen et al., 1985). Exercise is a subset of physical activity, specifically structured, planned, and repetitive physical activity aimed at improving physical fitness (Caspersen et al., 1985). Unless specifically mentioned otherwise, I will utilize both terms interchangeably in this literature review.

dosa was dearranged [*sic*] or not in equilibrium with other dosas, and 3) health prevailed when the dosas were in equilibrium” (Tipton, 2013, p. 110). This directly relates to Caraka’s contributions, as he believed that dosas cause disease when they are out of equilibrium. To prevent the disruption of dosas, he advocated for daily physical activity. Similarly, around the year 100 B.C., a Chinese physician of the East Han Dynasty stated: “The body needs exercise only it must not be to the point of exhaustion for exercise expels the bad air in the system promotes free circulation of the blood and prevent sickness” (Tipton, 2013, p. 110).

Additionally, in ancient Greece (700 B.C.), physical exercise was considered a national duty to the point that, in some city-states such as Sparta, men considered unhealthy or unfit were put to death. Spartans were, in simple terms, “addicted to exercise” (Tipton, 2013, p. 112). However, it was Pythagoras (570 – 490 B.C.), a former athlete and medical philosopher, who first advocated for turning the promotion of exercise from a civic duty into a health initiative (Tipton, 2013, p. 113). Around 500 B.C., teacher and physician Herodicus became the “father of sports medicine” because he recommended exercise to treat athletic injuries. Not long after, Hippocrates expanded Herodicus’ focus on using exercise to treat athletes to include people of all physical capabilities. Hippocrates was the first physician to prescribe exercise in writing. He stated, “eating alone will not keep a man well, he must also take exercise” (Tipton, 2013, p. 113). Following in Hippocrates’ footsteps, other physicians in ancient Greece, such as Archagathus (219 B.C.) and Aselepiades (128-56 B.C.), also took the initiative in prescribing such simple exercise as walking. Although each of these physicians inspired EiM proponents, none was as influential as Claudius Galenus, widely known as “Galen” (129-210 A.D.). He lived in the Roman Empire and spread the use of exercise to treat a variety of diseases in Arab and European

countries. His ideas had a lasting impact on medicine, shaping its practices for over a millennium (Tipton, 2013, pp. 114-115).

Leading into the 16th Century, Galen's influence lingered², and the overarching message about health was clear: everyone can maintain their health and prevent disease through exercise. Two important physicians of the 1700s, English Francis Fuller and Scottish William Buchan, published books advocating for exercise as the most effective means to ensure a good and healthy life. Buchan explained, “exercise alone would prevent many of those diseases which cannot be cured, and would remove others where medicine proves ineffectual” (Buchan, 1813, pp. 43 & 86, cit. in Berryman, 2010, p. 195).

In the late 1800s and early 1900s, many medical concepts evolved and quickly underwent drastic shifts. In the 1880s, the American Association for the Advancement of Physical Education was founded out of the physical education movement, one that advocated exercise as a means of maintaining health (Berryman, 2010, p. 196). However, American medicine quickly turned away from this movement. Medical schools began to teach future physicians to focus on the scientific methods of curing disease rather than preventing it. In other words, students learned more about treating patients with pills and other forms of treatment when the person was already ill or injured than about helping patients prevent these conditions. Physical education was dwindling as physicians increasingly paid less attention to exercise and no longer viewed it as a form of medicine.

² To broaden the scope of the discussion on exercise as medicine, it is important to acknowledge that the Middle Ages are often overlooked in EiM accounts. Some may attribute this omission to the widespread belief that religious views prioritized spiritual cultivation over physical well-being. However, scholars have challenged this notion and provided evidence of physical exercise practices during the Middle Ages that contributed to the intellectual developments of the Renaissance (for more on this topic, see Zeigler, 2006).

Accompanying this change in the early 1900s was the idea that physical activity was important only for fun and games. In fact, the “role exercise once played in the larger health scheme of America had become lost in new physical activities whose success was measured in win-loss records rather than the overall health” of an individual (Berryman, 2010, p. 198). In 1964, change within physical education began to spring once again. Franklin Henry, a professor at Berkeley, had the biggest impact on making physical education a field of study. He emphasized developing rigorous programs that taught the importance of exercise and sport. From Henry’s efforts, departments such as Exercise Science, Human Movement, and Kinesiology made their way into academia to spread the word that “both physical activity and physical inactivity were key elements of health” (Berryman, 2010, p. 198).

In the mid to late 1900s, physical education scientists contributed to forming the American College of Sports Medicine (ACSM) after extensive research led them to join forces with physiologists and cardiologists. ACSM partnered with the American Heart Association and the American College of Cardiology to make exercise a critical component of the medical field. These associations worked with the U.S. Centers for Disease Control to turn the bridging between exercise and healthcare into a more serious discussion. In 1979, reports again began to raise public awareness that physical activity and nutrition are key components of chronic disease prevention (Berryman, 2010, p. 199). This trend continued when the U.S. Public Health Services declared physical activity a national goal to improve health, and the magazine *The Physician and Sportsmedicine* launched the first Exercise is Medicine campaign in the 1980s. Physical activity remained a top priority of U.S. health initiatives, leading to what is known as modern medicine today. Perhaps the most historically significant event for the acceptance of the view that exercise is a form of medicine was the meeting with the American Medical Association and the American

College of Sports Medicine at the National Press Club in Washington, D.C., on November 5, 2007, where the Exercise is Medicine health initiative was born (Berryman, 2010, p. 199).

The goal of this initiative is “to make physical activity assessment and promotion a standard in clinical care” (Winters, 2020, p. 319). In doing so, EiM would link medical professionals with exercise professionals to create personalized workout programs for patients. Although other physical activity-promoting proposals exist, EiM is unique because it aims to integrate the fitness industry as a regular part of health care. In general, EiM aims to close the gap between the two fields to increase physical activity and overall health worldwide.

Chapter 2

Supporting Arguments of the EiM Initiative

The myriad support for the EiM proposal, including evolutionary, medical, biological, and cognitive perspectives, is undeniable. As paleoanthropologist Daniel Lieberman (2015) explains, humans are biologically configured to keep their bodies moving and physically active. In general, every animal has adapted to be physically active to eat, reproduce, and flee from danger. “Humans are no exception” to this adaptation (Lieberman, 2015, p. 314). For example, humans evolved “to live and eat in Stone Age conditions” as hunter-gatherers (Lieberman, 2015, p. 314). At this time, humans had to put extensive effort into hunting and gathering for survival, which kept them fit. Thousands of years later, people can do without much movement on a daily basis. Physical activity is no longer essential to acquire resources. Not only is it unnecessary to catch or grow food, but people are not even required to go out to the supermarket because businesses like InstaCart, UberEats, and GrubHub make food readily available with minimal effort needed. The human body has adapted to require movement, but current levels of physical inactivity around the globe have become unnatural for humans. The lack of physical activity has come to light clearly in recent years. One set of data showed that 36% of the U.S. population reported being completely sedentary, and only 33% were insufficiently active (Coleman et al., 2012, p. 2071, cit. in Sallis, 2015, p. 24). Similarly, 2022 reports show that 80% of youths and 27% of adults do not meet the guidelines for physical activity (World Health Organization [WHO], 2022). Like many other countries, the U.S. uses the recommendation that 150 minutes of moderate to vigorous activity each week is the minimum amount of exercise that adults should obtain each week to maintain their health (Sallis, 2015, p. 24). However, less than one-third of

U.S. citizens meet these guidelines. As the modern world makes it easier to live without being physically active, it is now necessary for people to exercise for better health. Notably, many diseases have become more frequent or severe because “the body is inadequately or insufficiently adapted to modern environmental conditions” (Lieberman, 2015, p. 317). In other words, recent changes in the environments in which humans live play a direct role in the lack of physical activity, which has consequently influenced the increasing prevalence of many chronic diseases. Although, according to Lieberman, it never evolved to be a form of medicine, physical activity is now a necessary tool to prevent disease.

From a medical perspective, exercise is critical to improving health because physical inactivity is directly tied to chronic disease. Dr. Steve Blair described in a 2009 issue of the *British Journal of Sports Medicine* that “physical inactivity is the biggest public health problem of the 21st century” (Blair, 2009, p. 1, cit. in Thompson et al., 2020, p. 512). One study found that physical inactivity is responsible for 1 in 10 premature deaths worldwide, making it the second leading cause of lifestyle-related chronic disease (Coombes et al., 2013, p. 600). In fact, “if inactivity decreased by 25%, more than 1.3 million deaths worldwide could be averted every year” (Thompson et al., 2020, p. 512). Based on this, change is clearly needed to improve the health and quality of life of people around the world. Bridging the gap between the fitness industry and the medical field (i.e., making the two industries work alongside each other), as EiM advocates propose, is essential because of the impact that exercise and physical activity have on our overall health and disease prevention. In the United States alone, “more than 30 million adults are estimated to have diabetes, 95% of whom have Type 2 diabetes” (Thompson et al., 2020, p. 511). Unlike type 1 diabetes, type 2 directly correlates with lifestyle. This means that maintaining an active lifestyle would help prevent most cases of diabetes in the U.S. This is

not only the case for type 2 diabetes, but also for many other chronic diseases. For example, a physically inactive lifestyle is associated with various forms of cancer, including those affecting the bladder, breasts, endometrium, esophagus, kidneys, stomach, and lungs (Thompson et al., 2020, p. 511).

The relationship between activity and health is linear. Typically, those who stay active live longer, and those who are physically inactive suffer from disease and die younger. Physical activity is so beneficial because behavior accounts for about half of a person's overall health status (Sallis, 2015, p. 22). Understanding how exercise benefits the body is crucial to recognizing why physical inactivity increases disease risk. Almost every body system is stimulated when a person engages in physical activity. For example, the circulatory system is greatly improved by exercise. Moderate to vigorous exercise “stimulates expansion of peripheral circulation, causes ventricular enlargement to increase cardiac output, and increases arterial elasticity” (Lieberman, 2015, p. 316). Hence, low cardiovascular capacity and high rates of heart disease are more common among physically inactive individuals. Furthermore, exercise puts mechanical stress on the bones, which contributes to improving the skeletal system. Consequently, relatively sedentary people may have weaker bones and be at risk of diseases such as osteoporosis (Lieberman, 2015, p. 316). Another system strengthened by exercise is the nervous system. A physically inactive person may experience poor mental health and develop a higher risk of suffering from dementia because exercise is necessary for increasing neuronal functioning (Lieberman, 2015, p. 316). This is just the surface of the benefits that exercise can have on people's health.

Physical activity influences mental health and overall well-being. In a study of youth populations, exercise reduced mental distress, depression, and anxiety. The study also concluded

that exercise boosts “self-esteem and motivation within youth populations – including among those experiencing mental health disorders” (Furzer et al., 2021, p. 2). In 2020, 17 million people in the U.S. struggled with depression, which is directly linked to physical inactivity (Thompson et al., 2020, p. 511). Physical activity can reduce the incidence of depression across all age groups, including fewer symptoms of the disease in children and reduced feelings of depression in both healthy adults and adults with pre-existing mental conditions. Furthermore, dementia and Alzheimer’s disease are increasing more alarmingly and faster than ever. Scientists predict that the latter will affect more than 7 million people over 65 in just a few years (Thompson et al., 2020, p. 511). In fact, “one new case of major cognitive decline is detected every 4 seconds,” making it “one of the most pressing healthcare issues of the 21st century” (Nagamatsu et al., 2014, p. 943). Dementia will continue to increase every year if people’s habits remain unchanged. Lifestyle is the main interest to both prevent and treat diseases such as Alzheimer’s and other dementias, as there are currently no medications to cure them. In both the general population and people with pre-existing medical conditions, physical activity reduces the risk of dementia by improving cognition (Thompson et al., 2020, p. 513). Randomized control trials demonstrated that 12 months of resistance training resulted in increased functional plasticity and improved selective attention. These trials also noted aerobic training improved verbal memory and learning (Nagamatsu et al., 2014, p.943). The positive impact that physical activity has on mental health supports the EiM initiative, especially considering today’s prevalence of mental illnesses such as depression and Alzheimer’s. It has never been more important for the population to be physically active to minimize this problem.

Healthcare costs are another reason that introducing EiM around the globe would be beneficial. In other words, physical activity directly affects healthcare costs. A study found that

“active patients had almost 30% lower health care costs than those who were inactive” (Sallis, 2015, p. 23). By keeping the body moving, individuals put themselves at lower risk for various diseases and conditions that require expensive treatments. For example, diabetes has become “the most expensive disease in America,” costing the country \$327 billion annually. This goes beyond the United States. In Australia, a 2007 report concluded that if every citizen engaged in 30 minutes of physical activity per day, the country’s healthcare system could save \$1.5 billion each year (Coombes et al., 2013, p. 600). If the promotion of health and well-being alone is not enough for a society to embrace the EiM initiative, then considering the cost difference between inactive versus active populations might make the implementation of the program more enticing.

Chapter 3

Opposing Arguments of the EiM Initiative

Despite the extensive evidence supporting the EiM initiative, its proponents must confront many criticisms concerning barriers, flaws, and limitations to be overcome in implementing the initiative. One of the strongest differing points is that using exercise as a form of medicine takes away some of the elements of a more holistic approach to exercise, such as the joy that exercise can bring someone. EiM seems to primarily build on the medical model of exercise, which strongly centers the promotion of physical exercise on “the importance of health and the absence of disease” (Smith, 2016, p. 131). In other words, advocates of the medical model emphasize that the purpose of exercise is to maintain physical health above any other benefits of exercise. However, it is important to recognize the existence of a broader understanding of medicine, one constructed around the concept of well-being. In this view of medicine, health should not be defined only by one’s physical fitness, but also by mental and emotional elements such as happiness and enjoyment. For instance, consider the World Health Organization’s (WHO) definition of health as a “state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, n.d.).

Although physical health is a necessary component of health, “it is not sufficient” for achieving a good quality of life (Smith, 2016, p. 132). A person’s mental, social, and emotional health are also factors of well-being, and exercise exerts a tremendous influence on them, as explained in the previous section. Thus, drawing on broader views of health, scholars have formulated alternative, more expansive approaches to exercise. Consider the recreational model. Its advocates argue that exercise has “value in and of itself as a life-affirming experience” and

“enables us to experience the joy of embodiment and to remain in the moment” (Smith, 2016, p. 133). From this perspective, when labeled as a mandatory medical treatment, exercise loses its enjoyment and inherent value; it becomes a means to an end, or a “thing and object to be prescribed, and a particular intensity to be met” (Cairney et al., 2018, p. 393). Consequently, people may lose sight of the intrinsic value and enjoyment that exercise provides.

Another argument against EiM is that, while conveying that exercise is the best way to prevent and treat disease may appear beneficial to some, it can also be a harmful and counterproductive message. Specifically, this mindset puts disease prevention and overall health improvement efforts solely on the individual, “whose behavior (or failure to behave correctly) becomes, itself, a cause of disease” (Cairney et al., 2018, p. 392). In doing so, this ideology portrays exercise as a “social mandate” for maintaining good health and even suggests that a lack of activity makes one a failure (Cairney et al., 2018, p. 392). It is harmful to instill in individuals the notion that they have total control over their physical health; even the fittest people cannot defend themselves from diseases. For instance, a woman who works out daily and eats healthy her whole life may still be diagnosed with cancer. Similarly, all the exercise in the world might never cure someone following an injury. A specific example of this is a man who experienced a spinal cord injury and consistently engaged in vigorous exercise in the hopes of restoring his movement. Although he reported “getting fitter” from partaking in his exercise schedule, he still had a lack of control and movement below his injury site even after following said intense exercise program (Williams et al., 2017, p. 5). Despite lowering the risk of suffering from many chronic conditions, exercise should not be promoted as a “panacea or magic pill to be delivered by medical and health service providers” (Cairney et al., 2018, p. 391).

Additionally, EiM activists appear to assume that exercise is feasible for everyone. If sports or medical professionals tell the public that they must get up and move more regularly to be healthy, such professionals must accept the possibility that some people are simply unable to do so. Therefore, the initiative is “a push that is exclusionary of a range of bodies and abilities” (Cairney et al., 2018, p. 392). The messages of EiM assumptions are even somewhat discriminatory against certain bodies, which puts some people at a social and physical disadvantage (Cairney et al., 2018, p. 392). For instance, take someone who is paralyzed from the waist down. This person cannot be placed under the same exercise recommendations as others by healthcare professionals. Also, some public health messages, such as “sit less, stand more” (Cairney et al., 2018, p. 392), are ignorant of a wide variety of people who are physically unable (e.g., someone in a wheelchair or someone too weak from an illness).

In addition to the potential physical barriers that people face, EiM also fails to address accessibility barriers. These include parks and gyms that are not wheelchair accessible, gyms that are too expensive for people, and transportation barriers to gyms or recreational facilities. If a person cannot access machines or places to work out, they will miss many opportunities to benefit from exercise. In fact, “transport and not health policy may be the key to promoting health-enhancing physical activity” (Smith, 2016, p. 131). One of the most frequently overlooked barriers limiting participation in physical activity is that “exercise tends to be an uncomfortable experience” (Nesti, 2016, p. 135). To many, exercise is stressful, sometimes even painful, and “up against the competing attractions of sedentary behavior” (Nesti, 2016, p. 136). Since most humans do not require a physically exhaustive lifestyle, health professionals who want to increase physical activity levels must confront the fact that many view exercise as

uncomfortable. Overall, several barriers make physical activity difficult or unachievable that EiM activists need to break down to make the initiative valuable.

The next opposing point is that exercise is sometimes harmful. Negative effects can sometimes result from a doctor's exercise prescription. Physically inactive people are at a higher risk of acute complications. Specifically, the threat of a cardiovascular event could be “transiently elevated during and just after vigorous physical exertion for susceptible individuals” (Pugh et al., 2017, p. 1555). Risk factors, such as prior cardiovascular, metabolic, or renal diseases, can influence these acute complications. Without addressing these risk factors, a doctor may under- or over-prescribe exercise. One size does not always fit all; not everybody requires the same type, intensity, or length of physical activity. Furthermore, someone with consistently low levels of physical inactivity is more susceptible to sudden death during unfamiliar vigorous exercise. Sport medicine professionals know this as the “paradox of exercise” (Pugh et al., 2017, p. 1555).³ Even though exercise is proven to have many long-term benefits, the paradox highlights how dangerous it may be for someone to suddenly be instructed to start exercising with little guidance. Regular exercisers have a dramatically lower chance of experiencing complications (Pugh et al., 2017, p. 1555). The potential complications of exercise extend beyond the beginning of a person's exercise journey. Possible consequences can result from long-term participation in physical activity, such as physical and psychological injuries or long-term impairments (Cairney et al., 2018, p. 394). In fact, in a survey of 2,000 individuals, about 60% reported having “recurring pain as a result of an injury gained from sport or exercise in the

³ As per Jonathan Pugh and his collaborators (2017), the exercise paradox refers to the potential to overdo it during exercise, leading to the risk of injury or cardiovascular complications rather than solely gaining benefits. However, other accounts of this paradox can be found in the literature. For instance, Lieberman (2015) identifies the exercise paradox as the phenomenon whereby people avoid exercise despite knowing its benefits (p. 313).

past” (Gervis, 2019). In prescribing exercise as a form of medicine, it would be wrong to ignore the potential short- and long-term injuries or complications that could result, regardless of a person’s experience with exercise.

Next, the existing low adherence rates to medical advice are a reason that EiM critics doubt that the initiative will successfully gain adherence from the public. In fact, the WHO said in the early 2000s that the “prevalence of non-adherence to prescriptions in developed countries is about 50%, and as many as half of these are intentional” (Cairney et al., 2018, p. 394). In other words, only half of the people listen to medical professionals’ prescriptions, which are often as simple as taking a couple of pills a day. The adherence to exercise prescription would possibly not be any different, or even worse, given how “effortful and complex” (Cairney et al., 2018, p. 394) it would be to start regularly engaging in physical activity. Therefore, the EiM initiative might not be the solution to get the public to begin an exercise journey for their health, let alone stick with it over the long term. Doctors and medical professionals tell patients to do many things for their health, such as quitting vaping or smoking, eating healthy, wearing a mask in crowds, or taking certain medications. Still, people continue to ignore these suggestions. It will take more than just labeling exercise as a form of medicine to make exercise attractive to the public.

A limitation further within the medical field that has delayed the implementation of EiM is the concern that physicians might become overburdened if the responsibility to enforce the initiative is placed on them. A considerable step of merging exercise and medicine is from a health care provider. EiM advocates suggest physicians evaluate each person’s physical activity and give them instructions on what to do if their patient falls below the guidelines. They propose regarding physical activity as a vital sign by asking how many days a week and for how many minutes a person exercises (Sallis, 2015, p. 24). These questions would be followed by advice

from the physician on achieving the proper guidelines or providing the patient with a referral to an exercise specialist. Since many physicians do not “have the time or the comfort level to counsel patients who are not active to start a program,” this crucial step in implementing EiM is problematic (Winters, 2020, p. 319). Although most physicians understand the importance of exercise, there is still no clear plan for these healthcare providers to play their role efficiently.

Chapter 4

Progress Within the EiM Initiative

There is an abundance of valid arguments against the EiM initiative; however, advocates are working daily to solve each limitation and barrier that this movement faces. One such limitation is the loss of the greater impacts of exercise beyond physical health. Many propositions refute this argument and emphasize the holistic message of EiM concerning a person's overall well-being. For example, Sallis suggests that suffering prematurely from chronic diseases will impact a person's "functional capacity" and cause them to live in a state of "deficient survival" (Sallis, 2015, p. 23). Even though his point centers around the physical consequences of inactivity, he draws attention to the bigger picture: a low-quality lifestyle that people may experience when they do not care for their physical health. A low-quality life, as Sallis describes it, is when a person is "alive but not really living" because their premature complications prevent them from going about their everyday lives and doing normal tasks (Sallis, 2015, p. 23). Thus, for EiM proponents, exercise is not only about physical health.

Furthermore, EiM supporters include mental health as a part of the effort. In other words, Nagamatsu et al. recognize that EiM is more than just physical health (2014, p. 943). They discuss the cognitive benefits of exercise, proving that the progression of EiM has resulted in a broadened focus on all areas of a person's well-being. Lastly, more recent implementations of the initiative have considered how exercise can improve a person's social welfare. A specific example is the launching of the Exercise is Medicine Global Research and Collaboration Center platform by the Global Diabetes Research Center at Emory University's Hubert Department of Global Health. One purpose of this app is to empower the client "to share [their] own data with

any caregiver or connect and share data with friends via a secure social network” (Lobelo, 2017, p. 113). This shows that EiM implementers are applying the social benefits that exercise can have as the initiative evolves. Overall, these examples contradict the argument that EiM reduces quality of life to physical health.

Another criticism discussed in the previous section is that EiM encounters implementation limitations yet to be solved for the initiative to be successful. Although there is still validity in this statement, the initiative’s proponents have proposed many solutions to break through some of these barriers. Consider the barrier resulting from the fact that many people find exercise to be an uncomfortable experience. A way to refute this statement is to focus on the power of walking, which could appeal to the population that dislikes intense and uneasy workouts. In fact, walking has been referred to as “the default exercise prescription” because it is “extremely accessible for all ages and fitness level abilities” and “is low-cost and doesn’t require a gym or specialized equipment” (Sallis, 2015, p. 26). Although this does not consider those unable to walk, this suggestion from Sallis simplifies the “exercise” in EiM so that it not only entices the population that finds more intense exercise uncomfortable, but also diminishes accessibility barriers such as the cost of equipment or gyms and transportation. Whether walking or something else, many proposed exercises try to engage the population who is hesitant to start or faces time, transportation, or monetary restraints. (See Table 1)

Table 1

Strategies to Reduce Sitting Time (Coombes et al., 2013, p. 602)

At Home	At Work	While Traveling
<ul style="list-style-type: none"> • Get out of the couch and walk around the house during commercial breaks • Do household chores, such as folding clothes, washing dishes, or ironing, while watching television • Stand to read the morning paper • Wash your car by hand rather than using a drive through car wash • Move around the house when checking text messages and e-mail on your mobile phone 	<ul style="list-style-type: none"> • Stand and take a break from your computer every 30 minutes • Take breaks in sitting time in long meetings • Stand to greet a visitor to your workspace • Use the stairs • Stand during phone calls • Walk to your colleagues' desk instead of phoning or e-mailing • Drink more water—going to the water cooler and toilet will break up sitting time • Move your bin away from your desk so you have to get up to put something in it • Use a height-adjustable desk, so you can work standing or sitting • Have standing or walking meetings • Use headsets or the speaker phone during teleconferences, so you can stand • Eat your lunch away from your desk • Stand at the back of the room during presentations 	<ul style="list-style-type: none"> • Leave your car at home and take public transport, so you walk to and from stops/stations • Walk or cycle at least part way to your destination • Park your car further away from your destination and walk the rest of the way • Plan regular breaks during long car trips • On public transport, stand and offer your seat to a person who really needs it • Get on/off public transport 1 stop/station earlier

Lastly, the skepticism surrounding how EiM may work in the medical field has prevented the initiative from flourishing. Despite the remaining efforts required to connect the fitness industry and the medical field, significant advancements and suggestions have been made toward achieving this goal. A point that refutes the common concern that EiM will overburden physicians is that the actual vision relies on multiple areas for success, including healthcare providers, exercise professionals, and digital technology (Winters, 2020, p. 319). Put differently, the burden does not all fall on the physicians. In fact, the EiM concept presents that healthcare

providers' main responsibility is to implement the first step. This includes assessing their patients' activity level and, from there, determining whether to flag them, providing them with counseling, and/or referring them to an exercise professional (see Figure 1) (Winters, 2020, p. 319). From here, the responsibility would transfer to the hands of the fitness industry. The roles of these professionals are to "provide exercise counseling, P.A. education, and customized exercise programs to facilitate behavioral change" (Winters, 2020, p. 320). This leads to the next major concern that many EiM critics have: a referral alone and brief counseling from a physician are not always enough to get someone to start exercising.

Figure 1

Example of an exercise prescription and referral form (Coombes et al., 2013, p. 603)

EXERCISE PRESCRIPTION & REFERRAL FORM



PATIENT'S NAME: _____ DOB: _____ DATE: _____
 HEALTH CARE PROVIDER'S NAME: _____ SIGNATURE: _____

Type of physical activity:	Aerobic	Strength
Number of days per week:		
Minutes per day:		
Total minutes per week*:		

***PHYSICAL ACTIVITY GUIDELINES**
Adults aged 18-64 with no chronic conditions: Minimum of 150 minutes of moderate physical activity a week (for example, 30 minutes per day, five days a week) and muscle-strengthening activities on two or more days a week (2008 Physical Activity Guidelines for Americans).
 For more information, visit www.acsm.org/physicalactivity.

REFERRAL TO HEALTH & FITNESS PROFESSIONAL

Name: _____

Phone: _____

Address: _____

Web Site: _____

Follow-up Appointment Date: _____

Notes: _____

As explained in Section 3, low adherence rates to medical advice are commonplace. Therefore, it is valid to question whether a person will take the suggestion to begin exercising just because their physician told them to do so. However, EiM advocates have considered ways

to solve this problem. One of these solutions is a referral network. Once a patient is flagged and referred to an exercise professional, that professional will be able to contact the individual for a follow-up to initiate a visit, provide them with counseling, and assess what stage the patient is in of making behavioral changes (Winters, 2020, p. 320). Additionally, evidence from multiple studies has shown “that patients who are referred to a community-based exercise program increased their P.A. and adhered to this 6– 12 months” (Winters, 2020, p. 319). Sallis also stated that there is “good evidence” that counseling, even in small amounts, has successfully increased patients’ physical activity levels (Sallis, 2015, p. 23).

The final limitation of successfully implementing the initiative into the medical field, which EiM advocates have attempted to refute, is physicians’ hesitation to counsel patients and confidently refer them to exercise professionals. However, this criticism of EiM can be countered by the fact that this is merely a setback if physicians do not understand the certification system (Winters, 2020, p. 320). Physicians may be “justifiably leery” to send their patients to “unqualified” exercise specialists, but the ACSM has created an EiM credential that ensures that only sufficiently educated and certified professionals will be acquiring the physician’s patients (Winters, 2020, p. 320). This helps strengthen the relationship between the fitness industry and the medical field so they can safely get their patients active together. In general, reasonable worries regarding the impact that EiM will have on the medical field remain. However, the initiative’s proponents have made significant progress in reducing these concerns and proposing solutions.

Chapter 5

Conclusion

This literature review has analyzed current research on the EiM initiative and overviewed the evolution of the understanding of exercise as medicine. In ancient times, exercise was prescribed as a form of medicine. As medicine shifted away from this idea and towards a more pharmaceutical approach, exercise and medicine became less and less intertwined. Centuries later, the EiM initiative was created to bridge the gap that grew between the two fields of study. Advocates of EiM offer many supporting points, such as the physical, mental, and social benefits of exercise. On the other hand, critics of the initiative make opposing arguments, such as the burden that will fall on physicians, the barriers that prevent people from engaging in exercise, the ways that EiM diminishes the holistic values that exercise can have, and the misleading messages that it will spread, including but not limited to the idea of exercise as a panacea. EiM supporters have refuted some of these criticisms and improved the initiative. Yet, they still encounter problems and resistance concerning the initiative's implementation in the medical field. Whether and to what extent their efforts will pay off is uncertain. However, what is certain is that both EiM activists and critics will continue working tirelessly to find ways to help individuals benefit from their engagement in exercise.

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ACADEMIC VITA

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Education

The Pennsylvania State University – University Park, PA

May 2023

Schreyer Honors College

Major: Kinesiology – Movement Science Option

Dean’s List (recipient all semesters)

The President’s Freshman Award Recipient (Spring 2020)

Related Professional Experience

Maximum Rehabilitation and The Vertigo Center – Springfield, PA

Physical Therapy Intern – Paid position, approximately 300 hours

Summer 2022

- Assisted Physical Therapist; performed therapeutic ultrasounds; set up electrical stimulation; guided patients through exercises

Observation Volunteer – 13 Hours

Summer 2021

- Shadowed a Physical Therapist who specialized in vestibular rehabilitation, as well as a strength and conditioning coach

Penn State University Health Services – University Park, PA

Fall 2021- Spring 2022

Physical Therapy Department Volunteer – 85 Hours

- Assisted Physical Therapists by relaying instructions to patients, setting up desired equipment, cleaning facility, and organizing patient files
- Observed Physical Therapists treat a wide range of injuries and physical conditions

Lankenau Medical Center, Wynnewood, PA

Sept. 2018-June 2019

Student in Medical Careers Program- Delaware County Technical School

- Rotated through clinicals and shadowed staff in various hospital units (including but not limited to: Operating Room, P.T. Department, Labor and Delivery Unit, Intensive Care Unit, Emergency Room)
 - Attended a daily Anatomy/Physiology and Medical Terminology related class in the hospital setting
-

Other Professional Experience

International Centre for Diffraction Data, Newtown Square, PA

Summer 2020, Summer 2021

Scientific Data Entry Summer Intern

- Organized data on various minerals and pharmaceuticals in database
 - Researched and corrected information that was missing from database
-

Activities

Penn State THON Volunteer

Special Events Committee Captain

April 2022- February 2023

“OPPerations” Committee Member

Oct. 2019- February 2022

Penn State Homecoming Volunteer

“OPPerations” Committee Captain

Feb. 2022- Oct. 2022

“OPPerations” Committee Member

March 2021- Oct. 2021