The Role of the Healthcare Practitioner in the Promotion of Physical Activity

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[The Role of the Healthcare Provider in the Promotion of Physical Activity]

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Abstract

Physical activity (PA) plays an important role in all aspects of one's health. As a non-invasive form of preventative medicine, it should be adequately incorporated in every person's weekly routine. One way to potentially increase a person's PA levels is by having healthcare providers discuss the importance of PA during office visits. Physician PA levels are related to their likelihood of discussing PA with their patients. Therefore, the aim of this study was to assess current knowledge of the PA Guidelines for Americans, personal PA levels, and confidence in discussing PA with patients by healthcare providers at the Point Loma Nazarene University (PLNU) Wellness Center prior to and after viewing an informational presentation about the American College of Sports Medicine Exercise is Medicine On Campus (ACSM EIM OC) program. Results of the surveys indicated that most Wellness Center employees met national PA guidelines for minutes of weekly PA (pre: 15/23, post: 5/5) and for meeting strength training guidelines (pre: 13/23, post: 5/5). Healthcare providers' comfort level discussing PA with patients was moderately high (pre: 4.1/5, post: 3.0/5 on a 5-point Likert scale). Despite the generally high individual levels of PA and comfort levels in discussing PA being moderately high, the number of Wellness Center providers who knew the PA Guidelines for Americans was low (pre: 1/23, post: 2/5). In conclusion, PLNU Wellness Center employees were physically active and comfortable discussing PA with patients; however, they would benefit from education about the PA Guidelines for Americans in order to best counsel patients about sufficient levels of PA.

Abbreviations

Abbreviation	Meaning
ACSM	American College of Sports Medicine
ADL	Activities of Daily Living
BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
CRF	Cardiorespiratory Fitness
CVD	Cardiovascular Disease
EHR	Electronic Health Records
EIM	Exercise is Medicine
EIM-OC	Exercise is Medicine On Campus
EVS	Exercise Vital Sign
KP	Kaiser Permanente
MDD	Major Depressive Disorder
MEP	Mean Evoked Potentials
PA	Physical activity
PAVS	Physical Activity as a Vital Sign
U.S.	United States of America
VAT	Visceral Adipose Tissue
WHO	World Health Organization

The Role of the Healthcare Practitioner in the Promotion of Physical Activity

Physical activity (PA) is a vital component of healthy lifestyles as it is associated with reduced risks of developing numerous chronic diseases and improving mental health. The Centers for Disease Control and Prevention (CDC) recommends that people aged 18 and above should aim to engage in at least 150 minutes a week of moderate intensity PA and at least 2 days a week of strength training activities (*How much physical activity do you need?*, 2022). Although the terms PA and exercise are often used interchangeably, the terms are distinct. PA is a broader term referring to movement of the body involving skeletal muscle engagement. PA requires energy expenditure greater than being seated or lying down (*Global action plan on physical activity 2018–2030: More active people for a healthier world*, 2020). Exercise is a subset of PA in that exercise is intentional, structured time engaged in for a purpose such as health promotion, weight loss, physical fitness, and/or personal enjoyment, while PA encompasses both exercise and non-exercise movement, such as climbing stairs and walking around the house or at work (*Exercise vs. physical activity,* 2020). Exercise examples include engaging in sports, running, and lifting weights at the gym. This paper uses the term PA as the PA Guidelines for Americans are based on total daily PA, including exercise. It is important to note that some studies discussed in this paper, especially randomized controlled trials, use the term exercise instead of PA because it is implemented in a structured manner. Since engaging in exercise is a method to get PA, these studies are pertinent.

Health Benefits

PA has numerous benefits and new benefits continue to be discovered. In regards to physical health benefits, PA reduces the risk of premature mortality, cancer mortality, and cardiovascular disease (CVD) mortality (Friedenreich et al., 2019; Moholdt et al., 2018; Sluik et al., 2012). Also, PA also helps prevent the development of type 2 diabetes mellitus, improves immune function, and helps to prevent falls and injuries related to falls (Kawakami et al., 2018; Landi et al., 2012; Marques et al., 2011; Nauman et al., 2017; Nieman & Wentz., 2019; Paulsen et al., 2017; Wei et al., 2022). Other benefits of PA include improved performance of activities of daily living (ADL), which include bathing, using the toilet, and self-feeding, improved sleep quality, and weight maintenance (Parra-Rizo & Sanchez-Soler, 2020; Varkevisser et al., 2018; Wang & Boros, 2019). In addition to extensive physical-related health benefits of PA, there is also a significant amount of psychological benefits, such as helping to prevent development of emotional and cognitive dysfunction, and social benefits, such as boosted confidence and reduced social anxiety (Della Fave et al., 2018; Erikson et al., 2019; Gao et al., 2013; Loh et al. 2019; Schuch et al., 2018; Soundry et al., 2015; Yu et al., 2020). Even healthcare savings can result from engaging in PA (Valero-Elizondo et al., 2016).

Physical Benefits

PA has a wide impact on the physical health of a person, including impacts on reducing premature mortality, reducing risk of developing diabetes mellitus, strengthening the immune system, preventing falls and fractures, improving performance of ADLs, improving sleep, and maintaining healthy weight (Ekelund et al., 2019; Friedenreich et al., 2019; Kumar et al., 2022; Chastin et al., 2021; Steffl et al., 2017; Scott et al., 2020; Parra-Rizo & Sanchis-Soler, 2020; Wang & Boros, 2019; Varkevisser et al., 2018).

Premature Mortality. A systematic review and meta-analysis showed that engagement in PA and reduction of sedentary lifestyle, as measured by accelerometry, are related to reduced risk of premature mortality (Ekelund et al., 2019). Another study found that PA is inversely related with all-cause mortality with the most significant reduction in all-cause mortality in groups that began as entirely inactive or moderately inactive (Ekelund et al., 2015). Sitting and sedentary behaviors are correlating factors of all-cause mortality, while meeting current recommendations of moderate-to-vigorous PA can reduce all-cause mortality. The more PA at a moderate-to-vigorous level, the more the reduction in all-cause mortality risk (Stamatakis et al., 2019). One study on the relationship between PA levels and mortality risk in adults with coronary heart disease (n=3,307) over a 30-year follow-up found that higher PA levels, especially sustained PA levels, which is when one is physically active and continues to be physically active over a long period of time, is positively associated with lower mortality rate in those with coronary heart disease. Those that did not get any weekly PA had the highest mortality rate. Those that engaged in PA, but did not meet American College of Sports Medicine's (ACSM) PA guidelines of at least 150 minutes per week of moderate-intensity PA and at least 2 days per week of muscle-strengthening activities had a lower mortality rate. Finally, those that met these guidelines had the lowest mortality rate (Moholdt et al., 2018). It is worth noting that the PA benefits extend to people who are considered overweight and obese by body mass index (BMI), which is weight in kilograms divided by height in meters squared. A study found that those who engage in regular PA have similar mortality rates from all-cause mortality regardless if they fall into a high BMI or low BMI group, which shows weight and obesity are not as significant as PA levels when it comes to their role of influencing mortality

risk (Barry et al., 2014). A study of individuals with diabetes (n=5,859) found that there was a significant decrease in mortality risk in individuals with diabetes that engaged in moderate activity levels when compared to physically inactive individuals with diabetes. In addition, walking was associated with decreased risk of cardiovascular disease mortality (Sluik et al., 2012).

Cancer. Patients with cancer who engage in higher levels of PA generally have a lower mortality rate than those who are sedentary (Friedenreich et al., 2019). By reviewing data up to 2018, the ACSM International Multidisciplinary Roundtable on Exercise and Cancer found that there is consistent and vast data suggesting that PA strongly lowers the risk of developing colon, breast, kidney, stomach, endometrial, esophageal, and bladder cancers. In addition, sedentary behavior is understood to place one at a moderate risk of lung, endometrial, and colon cancers. Post-diagnosis of cancer, thirteen breast cancer studies and nine colon cancer studies found that PA lowered mortality rate anywhere between 21%-45% (Patel et al., 2019).

Preventing Type 2 Diabetes Mellitus. In addition to reducing mortality in people with diabetes, PA can help prevent diabetes. In a longitudinal study of 31,464 older Indian people, the risk of developing type 2 diabetes was 2.5% lower in individuals who engaged in daily PA than people who did not (Kumar et al., 2022). A long-term study on 7804 men found that higher cardiorespiratory fitness (CRF) was associated with a lower risk of developing type 2 diabetes (Kawakami et al., 2018). Another study found that individuals who met PA guidelines had a significantly higher mean estimated CRF (Nauman et al., 2017). Regular PA contributes to increased cardiorespiratory fitness and therefore, a decreased risk of developing type 2 diabetes.

Strengthening Immune System. Acute durations of moderate-to-vigorous aerobic PA of less than sixty minutes can increase immunological function, stimulate the immune defense system, and lower inflammation over time (Nieman & Wentz, 2019). One systematic review found that higher PA levels were associated with a 31% decrease in risk of acquiring infection and a 37% decrease in infection-related mortality as compared to people that do not engage in PA or did not have PA levels meeting guidelines (Chastin et al., 2021). This finding corresponds with another systematic review that found that there was a decrease in C-reactive protein, which is associated with CVD risk, after exercise training for at least two weeks (Fedewa et al., 2017). A fifteen year follow-up study of 810,453 individuals found that physically inactive individuals had a 71% increased risk of acquiring a first-time blood stream infection (Paulsen et al., 2017). While there are chronic, long-lasting immune system improvements, the immune system can be temporarily suppressed by prolonged vigorous exercise. Single bouts of moderate-intensity exercise can enhance the immune system and have been shown to improve vaccination responses in "at risk" patients. However, vigorous-intensity exercise over prolonged periods of time may alter the immune response by reducing leukocyte function and immune system response to antigens, as well as increase pro-inflammatory cytokines. Elite athletes who engage in extensive vigorous-intensity exercise frequently report having symptoms related to upper respiratory tract infections during times of heavy training and competition (Bouchard, 2015).

Preventing Falls and Fractures. One study found that acute osteoporotic fractures were twice as likely in women with sarcopenia, a degenerative loss of skeletal muscle, of the leg than those without sarcopenia (Hida et al., 2016). This is a similar finding to another study that found that in a two year follow up with elderly people, those with sarcopenia were three times more likely to fall than those without sarcopenia regardless of sex (Landi et al., 2012). Similarly, a

study found an elevated risk of falling in older people with sarcopenia in low and middle income countries (Veronese et al., 2021). Another study found that over a two year period, older men that lost appendicular lean muscle had around double the risk of falling than those that did not. In addition, older men that maintained a higher muscle to fat ratio had a decreased risk for hip fracture (Scott et al., 2020). A study found that when elderly people with lower bone mineral density at the distal radius and proximal femur fell, they had a higher risk of fracture than people who fell with a higher bone mineral density in those areas (Uusi-Rasi et al., 2017). A systematic review found that decreased knee muscle strength is inversely correlated with an increased risk in falling (Manlapaz et al., 2019).

These falls and fractures are due to a number of factors related to inadequate PA levels, such as sarcopenia and reduced bone mineral density. A meta-analysis of nine studies involving older men and women found that the risk of sarcopenia was significantly lower in people that engage in PA (Steffl et al., 2017). Additionally, a study on people with sarcopenia found that of 30 people that engaged in only resistance training involving lower and upper body exercises three days a week for 24 weeks where each session lasted an hour, 40% recovered from sarcopenia. Another group of 30 people engaged in a mixture of 30 minutes of Yi Jin Jing exercise, which is a traditional Chinese, meditative full body stretching exercise, and 30 minutes of lower and upper body resistance training with otherwise the same parameters as the purely resistance training group. Forty three percent of the group combining Yi Jin Jing and resistance training recovered from sarcopenia. Handgrip strength measured by dynamometry is commonly used to assess if someone has sarcopenia. The participants were considered to have recovered from sarcopenia when one had a handgrip strength that increased above the threshold of 28 kg for men and 18 kg for women. In addition to a significant increase in handgrip strength,

significant increases in muscle mass and muscle cross-sectional area occurred as a result of the two interventions from this study (Wei et al., 2022).

A narrative review found that PA increases muscle mass, decreases the rate of being considered frail, and increases muscle strength (Haider et al., 2019). Moreover, a weight-bearing strength program study involving sixty older women found that muscle strength training led to significant increases in bone mineral density at the neck of the femur, increases in knee muscle strength, and greater balance (Marques et al., 2011). Thus, PA engagement, especially when involving muscle strengthening, can play a significant role in reducing falls and fractures by minimizing risk factors of falling and fracturing.

Performing Activities of Daily Living. As PA increases one's muscle strength, PA can lead to improved performance of ADLs. One study of 397 older adults found that high levels of PA are associated with higher levels of functional autonomy and increased performance of ADLs (Parra-Rizo & Sanchis-Soler, 2020). A study addressing the impact of PA on frailty, which is measured by unintentional weight loss, slowness, weakness, exhaustion, and low activity, found that a group of older individuals that engaged in a weekly minimum of 180 minutes of moderate PA had a four times higher likelihood of reducing the degree of frailty than the control group (Ng et al., 2015). Also, frailty can be associated with ADL disability. One study found that of several risk factors, frailty was the strongest determinant of the decline in ADL functioning (Shi et al., 2020). PA can indirectly reduce ADL limitations as frailty is reduced.

Improved Sleep. Regular PA has been shown to improve sleep quality by helping to regulate the body's natural sleep-wake cycle, reducing stress and anxiety, and promoting relaxation. A systematic review found nine studies that showed that people that engage in PA have improved sleep quality when compared to people who are physically inactive. Additionally,

moderate PA had better overall results on improving sleep quality than vigorous PA (Wang & Boros, 2019). In a study on the impact of moderate-intensity PA of a minimum of 150 minutes per week on people with insomnia, PA was found to reduce the instances of awakenings (Hartescu et al., 2015).

Maintaining Weight and Reducing Visceral Fat. In addition to having positive impacts on health, regardless of weight, PA can aid in weight loss maintenance. A systematic review found that of people that aim to maintain weight loss, increases in PA positively predicted weight loss maintenance (Varkevisser et al., 2018). Although PA supports weight maintenance, PA does not automatically lead to weight loss. One review found that weight loss is largely due to caloric restriction and no significant changes in weight are attributed to PA levels alone. The exception is when PA levels far exceed the minimum PA guidelines, but this is not ordinary for the general population (Swift et al., 2014). Although PA apart from caloric restriction may not reduce weight significantly, PA can reduce visceral body fat. A study that used diagnostic imaging to view visceral adipose tissue (VAT) found that time engaged in PA was strongly and inversely associated with VAT. The higher the daily PA, the lower the VAT. This is beneficial as VAT is an independent risk factor for metabolic and cardiovascular issues (Bouchi et al., 2015; Kaess et al., 2012).

Psychological Benefits

Aside from the myriad of physical benefits, research reveals considerable data suggesting the strong relationship between PA and psychological health.

Emotional Health. One study, looking at the impact of integrating PA programs on the emotional health of elderly individuals found that elderly individuals involved in exercise programs had a greater ability to regulate emotions, limit negative emotions and also increase positive emotions, and suppress their emotions to a lesser degree when compared to elderly individuals with a sedentary lifestyle (Della Fave et al., 2018). In cancer patients undergoing chemotherapy, PA has been shown to improve emotional health. One study assessed the impact of a home-based exercise program for older patients with cancer who were simultaneously receiving chemotherapy. The control group of cancer patients (n=122) received usual care associated with chemotherapy while the cancer patients in the study group (n=130) engaged in a resistance training exercise program. The daily number of steps taken by both groups were not significantly different, but the group that engaged in a resistance training exercise program on average engaged in resistance training at a mild to moderate-intensity for 2.3 days per week and each session lasted on average 22 minutes. There was a significant improvement in mood and significantly decreased levels of anxiety in the group that engaged in a resistance training exercise program when compared to the control group, which shows that PA, even at a low intensity, can have positive effects on emotional health (Loh et al., 2019).

Depression, Anxiety, Mood, and Stress. A systematic review found that there is moderate evidence that physical inactivity increases the risk for anxiety and that there is a strong positive correlation between sitting time and being at risk for anxiety (Teychenne et al., 2015). In regard to both depression and anxiety, decreased PA levels are associated with increased

moderate-to-severe depression and anxiety symptoms during the recent Covid-19 pandemic (Puccinelli et al., 2021). During the Covid-19 Pandemic, the mood and energy levels of many college students surveyed in this study had decreased. When the participants' activity levels were monitored, the results showed that PA was a strong determinant of mood and energy with increased PA correlating with positive mood and higher energy levels (Fennel et al., 2022).

One meta-analysis looked at the relationship between PA and incidence of depression by analyzing 49 studies including a total of 266,939 individuals. The meta-analysis found that high levels of PA are associated with a 17% lower risk of developing depression when compared to low levels of PA. The study describes high levels of PA as being above 150 minutes per week of moderate-intensity PA and low levels of PA as being below 150 minutes per week of moderate-intensity PA (Schuch et al., 2018).

The mechanisms by which PA reduces depressive symptoms have become more apparent. One study looked at whether PA improved symptoms of major depressive disorder (MDD) by restoring deficient neuroplasticity. Neuroplasticity is described as lower synaptic density and the deficiency in neuroplasticity occurs specifically in the motor cortex. One group (n=23) of patients with MDD had a PA intervention of three 60-minute sessions weekly for three weeks; each session's focus was on either coordination, endurance, or strength. Neuroplasticity was measured by motor evoked potentials (MEPs), which is the response at the abductor pollicis brevis due to stimulation of the median nerve. The response was measured as the mean amplitude of the MEPs. The mean amplitude of the MEPs was the direct measurement of synaptic density and therefore, neuroplasticity (higher mean amplitude means greater neuroplasticity). The group that had the PA intervention had evidence of reversal of deficiency in neuroplasticity after the intervention, while the control group that did not engage in scheduled

PA had no significant change in deficiency in neuroplasticity. In addition, the study found that the higher levels of neuroplasticity in the MDD patients were highly correlated with lower MDD symptoms (Bruchle et al., 2021).

Lastly, a study of high school students in Korea found that physical education engagement was associated with decreased levels of stress in male and female students and a decreased rate of suicidal ideation in male students (Park et al., 2020). In addition to a reduction in the amount of stress experienced, anxiety can also be reduced and there is evidence of a neurobiological connection between stress and anxiety (Daviu et al., 2019). Since anxiety can be a potential cause of or factor in developing major depressive disorder, PA's role in preventing depression may work through this mechanism (Kessler et al., 2015).

Cognitive Function. A review incorporated by the 2018 PA Guidelines found evidence of general cognition improvements from moderate and vigorous intensity PA. These improvements include faster processing, improved spatial awareness, higher executive function, and improved memory. There is also a positive association between higher amounts of PA and greater reduction of risk of cognitive impairment, such as Alzheimer's disease (Erikson et al., 2019). Additionally, some studies suggest a relationship between academic success and PA. Math performance has been shown to improve with PA. A study found that grade school students that engaged in a dancing exercise-based program had greater improvement in math scores than a non-exercising comparison group (Gao et al., 2013). Also, a study looking at university students found that the greater the aerobic capacity of a person, the greater their concentration and attention in cognitive performance (Rodriguez-Garcia et al., 2022).

Social Benefits

Engaging in PA can provide social benefits. For example, a study found that students in an eight-week PA intervention had reduced social anxiety levels when compared to baseline levels and to a control group (Yu et al., 2020). These benefits extend to those with mental illness as well. A meta-analysis found that engaging in sports offers autonomy, meaning, and peer-encouraged positive experiences to people with severe mental illness, which boosts social confidence (Soundry et al., 2015). One study found that when a group of university students engaged in moderate-intensity rowing (n=17) at 24 strokes per minute in a synchronized manner, there was a significantly higher social bondedness between the group members than a group that only engaged in low-intensity rowing (n=17) at 16.5 stroked per minute in a synchronized manner (Davis et al., 2015). This shows how performing PA with others at moderate-intensities may increase feelings of group identity. One study found that of osteopathic medical students that engaged in exercise in a group fitness class (n=25) for one 30 minute session per week over a 12-week period, there were significant reductions in stress levels as compared to osteopathic medical students that engaged in exercise alone or with up to two partners (n=29) averaging 4.11 hours of exercise per week or did not engage in regular exercise (n=15) over that period (Yorks et al., 2017).

Physical Activity and Healthcare Savings

PA has benefits beyond the health of the individual as PA can provide monetary savings for individuals and healthcare systems. A large study involving 26,239 people with CVD found that on average after adjusting for covariates, people that met PA guidelines had lower healthcare expenditure compared to those who did not meet PA guidelines. Additionally, in individuals that did not have CVD, all categories of cardiovascular risk factor profiles, including poor, average,

and optimal, showed that on average, people that met PA guidelines had lower healthcare expenditure. A majority of the healthcare savings were attributed to lower costs from hospitalizations and prescription medications (Valero-Elizondo et al., 2016). This shows that there may be less health strain on individuals obtaining adequate PA, which contributes to the monetary savings on healthcare.

Physical Activity Levels, Barriers to Physical Activity, and Physical Activity in Healthcare

While PA has proven benefits, increasing PA engagement among those less active is necessary as there are many who do not get adequate PA (Carlson et al., 2010; Elgaddal et al., 2022; *FALL 2019 reference group executive summary*, 2021; *FALL 2022 reference group executive summary*, 2023). This is due to a number of barriers to PA, such as a perceived lack of time and a lack of motivation (Jodkowska et al., 2017; Johnson et al., 2018; Manandhar et al., 2019; Silva et al., 2022). PA promotion by healthcare providers is important to help overcome some of these perceived barriers. However, historically and even today, PA promotion is not embraced in all healthcare settings (Cardinal et al., 2015; Sreedhara et al., 2018). Some reasons for this include healthcare providers lacking confidence in discussing PA; lacking personal PA engagement, which may lead to less PA discussion; and lacking knowledge of PA guidelines (Mcfadden et al., 2019; Pang et al., 2018; Selvaraj et al., 2022). Thus, informing healthcare providers of the importance of PA and of the PA Guidelines for Americans is an important step in improving PA promotion in healthcare settings.

Current Physical Activity Levels

While the preventative and treatment benefits of PA are well established, the benefits are only experienced when people actually engage in PA. The World Health Organization (WHO) estimates that as of 2016, 28% of the world population does not reach global PA minimums, which are the same as the American PA guidelines. Moreover, the difference in PA levels between low-income countries and high-income countries was large with 12% of men and 24% of women not meeting PA guidelines in low-income countries and 26% of men and 35% of women not meeting PA guidelines in high-income countries. There is an inverse relationship between PA levels and a country's gross national product. In addition, WHO found no improvement in PA levels globally between 2001 and 2016. There is even a negative trend in high-income countries where physical inactivity has increased from 31.6% to 36.8% between 2001 and 2016. This is partially caused by increased sedentary behavior at work and at home, less PA during leisure time, and increasing utilization of transportation modes that do not require PA, for example, taking a motorized vehicle (*Physical activity fact sheet*, 2021).

While there have not been improvements in PA engagement globally, there is an increase in the proportion of people meeting PA guidelines in the United States of America (U.S.). Across the U.S., those that met the PA guidelines for aerobic activity, not including muscle-strengthening activities, in 2010 was estimated to be around 43.4%. This increased to 46.9% of the U.S. population in 2020. When also considering muscle-strengthening activities, the estimation increased from 18.2% of the population meeting PA guidelines in 2010 to 24.2% in 2020 (Carlson et al., 2010; Elgaddal et al., 2022). In California specifically, the percentage of individuals meeting aerobic activity PA guidelines is significantly higher. In 2013, 69.1% of adults in California met PA guidelines. This increased to 70.5% in 2017 (*Nearly 25 percent of*

adults say they aren't physically active, n.d.). In San Diego county as of 2017, 20% of adults age 18 and older did not engage in leisure-time PA. While this shows how active adults may be outside of work, it does not show the percentage of people meeting PA guidelines because PA may be done in work settings and people that engage in leisure-time PA may not be reaching adequate PA levels (*California: Data by county*, 2023). The National College Health Assessment II looks at the self-reported health of U.S. undergraduate students. In 2008 where 16,095 students responded from 40 colleges and universities, 42% met the aerobic PA guidelines (Wald et al., 2014). This jumped to 68% in 2019 where 43,140 students responded from 58 colleges and universities and more recently, 70% in 2022 where 35,692 students responded from 51 colleges and universities (*FALL 2019 reference group executive summary*, 2021; *FALL 2022 reference group executive summary*, 2023). This may be due to the promotion of recent PA Guidelines for Americans and the ACSM's promotion of PA, which are discussed within this paper.

While there may be an increase in the proportion of people meeting PA guidelines in the U.S., the rates of obesity are also rising. Globally, the rates of obesity have increased in all regions of the world between 1980 and 2015 with the average increasing from 5% to 10.1% in males and 8.9% to 14.8% in females (Chooi et al., 2019). According to 2021 data from the CDC's Behavioral Risk Factor Surveillance System, of all the U.S. states and territories, a minimum of 20% of the population had obesity. Of the forty-nine states and three territories with sufficient data, twenty-three of them had an obesity prevalence between 30% and 35%. California had a lower prevalence than most states and territories with 25-30% of the population having obesity (*Adult obesity prevalence maps*, 2022). Data from the National Health and Nutrition Examination Survey between 2011-2018 shows that obesity has increased from 34.9% to 42.4% in the U.S (Liu et al., 2021). These numbers are slightly higher than the CDC survey.

This jump in obesity levels when compared to the simultaneous slight increase in PA levels appears incongruent. One potential reason is that people generally overestimate their PA and underestimate their physical inactivity. One study showed how in a majority of cases, self-reported PA was higher than PA collected by objective devices like accelerometers (Steene-Johannessen et al., 2015). The studies mentioned in this paper utilized a mixture of objective data and self-reported data. The rise in obesity may be more related to dietary changes over time (Boushey et al., 2020).

Barriers to Physical Activity

With so many reasons to engage in PA, a substantial portion of the population still does not meet recommended PA levels. Many of the barriers to PA contribute to the high rates of obesity. According to one systematic review of which 34 studies involved high school students and 19 studies involved university students, the largest barriers to engaging in PA in young adults and college students included a lack of motivation, perceived lack of time, lack of social support, and lack of access to PA facilities (Silva et al., 2022). Another potential barrier to PA is a lack of perceived benefits to engaging in PA. One study of patient adherence to advice offered by exercise physiologists found that subjects were more likely to adhere to PA interventions if they expected positive outcomes (Johnson et al., 2018). One study of adolescents with an excessive body mass, which was defined as being overweight or obese based on classifications from the International Obesity Task Force standards, found they were more likely than those of normal weight to perceive more barriers to PA (Jodkowska et al., 2017).

Two studies have found that adolescents that utilized passive transportation, for example, taking a vehicle, had a greater risk of becoming overweight or obese than those that utilized

active transportation, such as walking or cycling (Hadianfard et al., 2021; Manandhar et al., 2019).

Promotion of Physical Activity in the Healthcare Setting

Healthcare professionals, in particular physicians and nurse practitioners, have an important role in promoting PA. However, one study found that over 50% of physicians do not receive a formal education about the benefits of PA and PA guidelines (Cardinal et al., 2015). This study also looked at the course offerings at all accredited allopathic and osteopathic medical schools in the U.S. and found that only 21.2% of schools offer courses related to PA, only 12.2% of schools made them a requirement (Cardinal et al., 2015). One study looking at the PA training courses amongst U.S. nurse practitioner programs found that of 200 institutions, 45% did not have a course that trained nurse practitioners to advise on PA (Falcon et al., 2022). Another study found that only 52% of 221 medical students from three Canadian universities knew of the Canadian PA guidelines, which are nearly identical to U.S. PA guidelines, recommending a minimum of 150 minutes of moderate- to vigorous-intensity PA. (McFadden et al., 2019).

A study on U.S. nurses (n=62) found that 59.7% of the nurses did not meet the most recent edition of the PA guidelines (Das & Adams, 2021). In contrast, a study on U.S. physicians and medical students found that physicians and medical students were more physically active relative to the general population where 84.8% of attending physicians, 73.2% of resident physicians, 67.9% of fellow physicians, and 84% of medical students met PA guidelines (Stanford et al., 2012). Personal PA levels are important as there is a strong association between personal PA levels and frequency recommending PA among physicians (McFadden et al., 2019). Furthermore, the greater the individual confidence levels in recommending PA to patients, the greater the likelihood of recommending PA to patients (McFadden et al., 2019). In categories of

assessing, advising, counseling, prescribing, and referring patients about PA, the medical students were more motivated than confident (McFadden et al., 2015). This shows a desire to promote PA, but an uncertainty in ability to promote PA to patients. Another study assessing how personal engagement in PA may influence recommending PA to patients found there was a significant association between engaging in "strenuous" activity and the frequency recommending PA whereas engaging in moderate or mild activity had no significant correlation (Cardinal et al., 2015). These results are corroborated by another study which found that primary care doctors that met PA guidelines had a significantly higher rate of initiating discussion of PA with CVD patients (Selvaraj & Abdullah, 2022). Even when physicians discuss PA with their patients, they may have a lack of confidence while doing so. In a study on 34 Canadian solid organ transplant physicians, 97% of the physicians indicated that they discuss PA with their patients, but only 18% are very confident in their ability to engage in PA counseling. The most cited barrier to PA counseling was a lack of time with 56% of the physicians indicating this. The second largest cited barrier to PA counseling for these physicians was a lack of knowledge of PA guidelines with 53% of the physicians indicating this (Pang et al. 2018). Data from the 2008 National Survey of Energy Balance Related Care showed that among U.S. Primary Care Physicians (n=1,060), 70.9% knew the PA guidelines, which at the time of the study, was thirty minutes of moderate-intensity PA on most days of the week (Pronk et al., 2012). Also, from the patient perspective, physicians do not always promote PA. One study found that around half of the U.S. population reported not receiving advice on increasing their PA levels from their physicians (Sreedhara et al., 2018). In addition, another study found that of primary care physicians (n=1,211) from across the U.S., less than half always gave specific guidance on PA to patients, regardless if they have a weight-related disease (Lobelo & de Quevedo, 2016). Overall,

there is a lack of knowledge of PA guidelines and a lack of training in discussing PA with patients.

While the role of the physician is vitally important to the promotion of PA, leading physicians and researchers associated with ACSM envision a fully integrated Exercise is Medicine (EIM) program that involves all workers within healthcare, including every role from physician and nurse practitioner to medical assistant and front desk staff (Thompson et al., 2020).

The Physical Activity Guidelines for Americans

The current PA guidelines for Americans were first introduced in 2008 by the U.S. Department of Health and Human Services. The PA guidelines are as follows: at least 150 minutes per week of moderate intensity or at least 75 minutes per week of vigorous intensity PA and at least 2 days per week of muscle-strength training targeting all of the major muscle groups. Moderate-intensity PA is activity where a person expends energy at a rate of 3.0-5.9 kilocalories per minute. It is done at an individual's personal capacity of 5-6 on a scale of 0-10. Activities that can be considered moderate-intensity PA include brisk walking, vacuuming, and raking leaves. Vigorous-intensity PA is activity where a person expends energy at a rate above 6.0 kilocalories per minute. It is done at an individual's personal capacity at or above 7 on a scale of 0-10. Activities that can be considered vigorous-intensity PA include carrying heavy loads up stairs, shoveling snow, and running. Muscle-strengthening activity is PA that increases skeletal muscle strength, power, endurance, and mass. Examples include lifting weights, doing push-ups, climbing trees, bringing in groceries, and carrying laundry. Major muscles are targeted, including legs, hips, back, abdomen, chest, shoulders, and arms. An inactive level of PA is when a person does not participate in moderate- or vigorous-intensity PA beyond basic movements inherent in daily life activities. Sedentary behavior is low-energy expenditure where an awake person

engages in sitting, reclining, or lying (*Physical Activity Guidelines for Americans, 2nd edition*, 2021).

Since the initial release of the PA Guidelines for Americans, a second edition was published in 2018. The new aspects of the second edition include an expanded discussion of health benefits of PA and the risks associated with sedentary behavior, guidelines for children ages 3-5, removal of the requirement for PA to be counted only if it occurred in bouts of greater than 10 minutes, and tested strategies that can be incorporated for increasing the population's PA levels, such as wearing PA monitors, using smartphone applications, adding accessible indoor and outdoor recreational areas, and encouraging peer and professional support. However, the main PA guidelines are the same. Adults should be engaging in at least 150 minutes per week of moderate-intensity aerobic PA to gain health benefits. Instead, at least 75 minutes per week of vigorous-intensity PA could be done to reap comparable health benefits to 150 minutes per week of moderate-intensity PA. Additionally, adults should engage in muscle strengthening activities of moderate or greater intensity that involve all major muscle groups at least 2 days a week because of additional health benefits, such as improved bone density, fall prevention, preservation of lean mass, etc (*Physical Activity Guidelines for Americans, 2nd edition*, 2021).

To reap substantial health benefits, adults should complete 150-300 minutes of moderate-intensity PA. Additional health benefits are potentially gained when adults exceed 300 minutes of moderate-intensity PA a week. Alternatively, adults should do at least 75-150 minutes of vigorous-intensity aerobic PA a week or an equivalent combination of moderate- and vigorous-intensity PA. Guidelines differ for those under 18. Also, it is still important for adults with health conditions or disabilities that may limit their ability to meet the guidelines to aim for as much PA as possible within their capabilities. They may consider working with certified

personal trainers that specialize in working with patients with physical disabilities and limitations (*Physical Activity Guidelines for Americans, 2nd edition*, 2021).

The American College of Sports Medicine

PA has been promoted in the U.S. before the PA Guidelines for Americans was released. Eleven physical educators and physicians founded the ACSM in 1954 to promote the importance and positive health impact of PA while also spreading awareness about the detrimental effects of smoking (*Historical archive*, n.d.). Since then, the organization has grown to include more than 50,000 members from over 90 countries, and provides certifications for being an exercise physiologist, clinical exercise physiologist, personal trainer, and group exercise instructor (*About ACSM*, 2023; *ACSM candidate handbook*, 2023).

Exercise is Medicine (EIM)

The EIM initiative was started in 2007 by the partnership between the ACSM and the American Medical Association (*What is Exercise is Medicine*, n.d.). The goal of this initiative is to standardize PA assessment and promotion in the healthcare setting (*Exercise is Medicine*, 2022). The EIM initiative includes PA as a vital sign (PAVS), which was formerly known and is still frequently referred to as the exercise vital sign (EVS), "prescribing" exercise, which involves encouraging patients to meet minimum PA guidelines, and referring out patients to fitness facilities and exercise professionals. PAVS is intended to be asked when patients enter a health clinic in a similar fashion to the routine collection of blood pressure, temperature, respiratory rate, and pulse rate. The PAVS questions are two simple questions on a patient intake form that ask about the amount of days per week that the patient engages in moderate-vigorous intensity PA and for how many minutes the patient engages in PA at that intensity. An electronic health records (EHR) system that has incorporated the PAVS system multiplies the answers to the

two questions to obtain the total minutes of weekly PA. Healthcare providers can use this information to encourage patients of the importance of meeting PA guidelines (*The miracle drug: Exercise is Medicine*, 2019). Kaiser Permanente (KP) was one of the first major healthcare plans to adopt EIM. An extensive study involving 1,793,385 adult participants was run through KP to see how easily EIM would be incorporated into the electronic medical records and offer patient data regarding PA. The study found that EIM was successfully able to be integrated within KP's healthcare system and the collected data from the EVS was able to discriminate various populations by the PA levels and find positive associations between decreasing PA levels and greater negative chronic health conditions, such as heart failure and cancer (Coleman et al., 2012). Another study validated the EVS as accelerometry data of 521 participants was compared to the EVS data and found a moderate agreement between the two PA assessment tools at identifying individuals that met and did not meet PA guidelines (Kuntz et al., 2021).

Since the inception of EIM, a transnational collaboration, known as EIM global health network, has been built, offering an annual World Congress on EIM where novel research is shared, and a global EIM Continuing Medical Education course is offered to assist healthcare providers in promoting PA. This is only a fraction of the expansion of EIM worldwide (Thompson et al., 2020).

Exercise is Medicine on Campus

The Exercise is Medicine On Campus (EIM-OC) program was launched in 2009 to bring EIM to university campuses. The goal of this program is to encourage students to develop lifelong PA habits within a supportive campus environment in hopes of preventing the development of chronic diseases (Winters & Sallis, 2015). As of spring of 2023, there are 173 U.S. and 25 international registered EIM-OC programs with twelve of the programs at small,

private, Christian universities (*EIM On Campus - Exercise is Medicine*, 2023). While research on EIM implementation has been conducted, it is largely isolated to mid-sized and large universities (Bopp et al., 2015; Melton et al., 2016).

Christian University Distinction

In addition to the size of the university, the type of university may have an impact on research conducted in a university setting. Christian universities may have an extra emphasis on health because health is a core part of Christians that view their body as a temple. Also, caring for the sick is a mission of Christians. For these reasons, health and therefore, PA which influences health, may be viewed and acted upon differently at a Christian university than a non-Christian university.

Purpose

The purpose of this study was to implement ACSM's EIM-OC at a small, private, Christian liberal arts university. Another aim was to assess the current knowledge of the PA Guidelines for Americans by Point Loma Nazarene University (PLNU) Wellness Center employees as the ACSM EIM-OC program was being initiated at the Wellness Center to aid in the implementation of the program. In addition, Wellness Center employee personal PA levels and comfort levels to discuss PA with patients were assessed. A questionnaire was utilized to assess the Wellness Center employees' knowledge of PA guidelines, personal PA levels, and comfort levels discussing PA with patients. This questionnaire was issued before and after an informational presentation to see if there were any changes as a result of viewing the presentation. It was hypothesized that individual PA levels, comfort levels in discussing PA, and knowledge of the PA guidelines were expected to increase as a result of the informational presentation.

Methods

Given the extensive health benefits of PA and the established model of integrating PA as a vital sign through the ACSM EIM program, researchers began the process of establishing PLNU as an ACSM EIM-OC university. At the beginning of the 2022-2023 academic year, the ACSM EIM-OC PLNU team was assembled, which included an undergraduate Kinesiology honors project student, a masters in Kinesiology student, a faculty adviser, a fitness professional, and the director of PLNU's Wellness Center. The team became familiar with the Wellness Center layout, the electronic medical records system, and the patient intake process. A pamphlet to be placed in and available at the Wellness Center was created and completed by September 27 (see Appendix A). It contained available resources for engaging in PA to the PLNU student body and some health benefits of PA categorized by specific systems of the body.

Questions regarding weekly PA levels were added into the EHR on October 3, 2022 by the data systems engineer, see *Figure 1*. The two values obtained for days per week and minutes of PA engagement are multiplied by the computer software to record the minutes of PA per week.

On November 8, Wellness Center employees including nurses, physicians, medical assistants, and non-clinical healthcare workers were invited to attend an educational session about the ACSM EIM-OC program that was in the process of being initiated at the PLNU main campus. All participants completed an informed consent form and were 18 years old and above. Prior to viewing the informational presentation, attendees filled out an anonymous online questionnaire about their own PA levels, their knowledge of current PA guidelines, and their comfort level discussing PA with patients (see Appendix B). Employees that were not present were emailed a link to the questionnaire and had access to the recording of the presentation, which they were requested to view after completing the questionnaire. Seventeen individuals

received this first questionnaire to be filled out before viewing the informational presentation. Responses for the first questionnaire (n=14) were collected one week after the questionnaire was issued.

The presentation contained the PA Guidelines for Americans, history of the ACSM EIM-OC program, select benefits of PA and problems with physical inactivity, the importance of the program, and a time for questions and answers. The purpose of the presentation was to fill any gaps of knowledge when it came to the importance of PA and current national guidelines about PA so that Wellness Center providers have greater confidence in discussing PA with patients. One month after the first questionnaire was sent out, a follow-up questionnaire was emailed to all the employees of the Wellness Center (n=18) at the time the follow-up questionnaire was sent out. This questionnaire repeated the questions asked in the first questionnaire to see if there was any change in responses following the presentation. Responses for the follow-up questionnaire (n=14) were collected one week after the questionnaire was issued.

1. On average, how many days per week do you engage in moderate to vigorous physical activity (like a brisk walk)?
2. On average, for how many minutes do you engage in physical activity?

Figure 1: Questions about patients' PA levels in the electronic medical record.

Results

Data were collected from 23 adults; 14 completed the survey when it was first administered in November and 14 completed the survey the second time it was sent in December; of those, 5 completed the survey after viewing the presentation. Of these five, only three respondents had also completed the survey prior to viewing the presentation in November. The roles at the Wellness Center of the participants are displayed in Table 1. The participants who completed the post-presentation survey in December, but indicated that they did not view the presentation were categorized in the group of participants before viewing the presentation.

Table 1

Roles at the Wellness Center

Roles at Wellness Center	**Before Viewing Presentation (n=23)**	**After Viewing Presentation (n=5)**
Physician	2	0
Nurse Practitioner	1	1
Registered Nurse	1	1
Nursing Student	3	0
Student Workers	4	1
Other	9	2
Did not indicate	3	0

Table 2

Questionnaire Results

	Before Viewing Presentation (n=23)	**After Viewing Presentation (n=5)**
Responses	Yes/No	Yes/No
Do you exercise?	20/3	5/0
Do you get at least 150 minutes of PA per week?	15/8	5/0
If not, do you get between 75-150 minutes of PA per week?	2/6[a]	
Do you strength train at least 2 days per week?	13/10	5/0
Do you know the current PA guidelines for Americans?	5/18	4/1
Correctly responded what guidelines are	1/22	2/3

[a]If the participants engaged in vigorous-intensity PA, guidelines would be met at or above 75 minutes.

The results of respondents that filled out the questionnaire before viewing the presentation and after viewing the presentation were recorded in Table 2. Of the eight

participants that did not meet guidelines before viewing the presentation, two of the participants exercised between 75-150 minutes weekly and may have reached PA guidelines of at least 75 minutes of weekly vigorous-intensity if they had engaged in vigorous-intensity PA. Since vigorous-intensity PA was not specifically asked about, the participants were placed in the group that did not meet PA guidelines. Of the five participants in the group that completed the survey before viewing the presentation and selected that they knew the PA guidelines, only one correctly responded what the guidelines are in the free response section for this survey question. The other four participants were incorrect about aerobic PA and strength training guidelines. Of the four participants in the group that completed the survey after viewing the presentation, two that selected that they knew the aerobic PA and strength guidelines correctly responded what the guidelines are in the free response section for this survey question. One participant was correct about the PA guidelines for moderate-intensity PA, but not vigorous-intensity PA or strength training. The other participant was correct about the PA guidelines for strength training, but not moderate or vigorous-intensity PA.

Table 3

Survey responses

	Before Viewing Presentation (n=23)	**After Viewing Presentation (n=5)**
Average weekly PA (minutes)	167	350
Average weekly strength training (days)	2.4	5.4
Average comfort levels on a scale of 1-5 (1 being least comfortable, 5 being most comfortable)[a]	4.1	3.0

[a]Participants that did not respond to the question about comfort level and participants that

indicated “N/A” were not included.

The average weekly aerobic PA, weekly strength training, and comfort levels discussing PA were summarized in Table 3. For the group that completed the questionnaire before viewing the presentation, there was a wide range of responses on the weekly minutes of PA, ranging from 0 to 500 minutes. For the group that completed the questionnaire after viewing the presentation, responses about the weekly minutes of PA, ranged from 300 to 500 minutes.

Discussion

The first aim of this study was to implement EIM-OC at a small private, Christian liberal arts university. The second aim was to look at the PA levels, knowledge of PA guidelines, and confidence in discussing PA of the healthcare providers at the Wellness Center and how these variables changed as a result of an informational presentation given to the Wellness Center employees.

As of April 20023, PLNU is officially registered with ACSM EIM-OC. Since October 2022, a PA “vital sign” has been embedded in the EHR alongside other health vital signs like blood pressure, pulse rate, and more. At this point, students that do not reach minimum guidelines are not being “flagged” with an alert in the system; it is up to the Wellness Center staff to notice the minutes of weekly PA and to interact with the patients about this. Given this, students may not be receiving sufficient PA advice or PA referral to fitness facilities and exercise professionals. A study on the experience of EIM-OC representatives implementing EIM-OC found that 17 of 38 campuses had no integration of an EIM solution for people that did not meet PA guidelines and only 10 of the campuses assessed a PA vital sign every patient visit (Wilson et al., 2018). To improve upon the process in place, a “red flag” could be created to appear in a patient’s chart when they do not meet sufficient weekly PA levels.

Individual PA engagement levels of PLNU Wellness Center employees before viewing the presentation (65.2%) was slightly below the California average of 2017 (70.5%), which shows that the Wellness Center has relatively active workers (*Nearly 25 percent of adults say they aren't physically active*, n.d.). Of the group that filled out the questionnaire before viewing the presentation, fifteen of the twenty-three respondents (65.2%) met the minimum of 150 minutes of weekly PA. Of the group that filled out the questionnaire after viewing the presentation, five of the five respondents (100%) met the minimum of 150 minutes of weekly PA. The California average in 2017 was 70.5% (*Nearly 25 percent of adults say they aren't physically active*, n.d.). In addition, the average weekly PA amount of the post-educational session questionnaire results was 350 minutes, which is very high compared to the 150 minute per week minimum for moderate-intensity PA according to the PA guidelines.

When considering strength training as well, of the group that filled out the questionnaire before viewing the presentation, twelve of the twenty-three respondents (52.2%) met both the strength training and aerobic PA guidelines. Of the group that filled out the questionnaire after viewing the presentation, five of the five respondents (100%) met both the strength training and aerobic PA guidelines. The national adherence as of 2018 shows that 24.2% of the adult U.S. population surveyed met both aerobic and muscle strength training guidelines (Elgaddal et al., 2022). The percentage of the Wellness Center employee population that responded to the pre-educational session survey who met aerobic and muscle strength training guidelines (52.2% was over twice the percentage of national levels (24.2%). The percentage of the post-educational session survey respondents that met aerobic and strength training guidelines (100%) was far higher than the percentage of national levels of aerobic PA and strength training guidelines (24.2%).

While a majority of the Wellness Center population meets PA guidelines, not everyone is meeting guidelines. The barriers may be due to a lack of time, motivation, energy, perceived benefits of PA, and more (Jodkowska et al., 2017; Johnson et al., 2018; Silva et al., 2022). In addition, self-reported values of PA may be inflated due to a desire to improve one's perceived appearance (Steene-Johannessen et al., 2015). Barriers to meeting guidelines were not addressed in this survey and future work should explore perceived barriers.

Out of the 23 participants responding to the pre-educational session questionnaire, only four indicated that they knew the PA guidelines (17.4%). Only one of the participants correctly answered what the PA guidelines are (4.3%). Out of the five participants responding to the post-educational session questionnaire, four indicated that they knew the PA guidelines (80%). Two of the participants correctly answered what the PA guidelines are (40%). However, since the sample size was small, this percentage may not be reflective of changes resulting from viewing the informational presentation. In addition, the other three participants did not correctly recall the PA guidelines after viewing the informational presentation. A study on U.S. healthcare provider knowledge of PA guidelines found that of 979 physicians, nearly 80% did not know PA guidelines, showing a lack of knowledge (Kahwash et al., 2022). The lack of knowledge about PA guidelines among PLNU Wellness Center staff is indicative of a potential lack of training in PA guidelines within education (Cardinal et al., 2015; Pang et al., 2018). Some may not feel it is necessary to know the guidelines for themselves. However, any worker in the healthcare setting should be emphasizing the importance of PA in their own lives and in the lives of the people they interact with during work and outside of work (Thompson et al., 2020). Thus, they must be further educated and trained to fully understand the PA guidelines and instruct student patients as well as any other people they interact with.

Although the knowledge of PA guidelines was relatively low, the pre-educational session survey showed that Wellness Center staff generally had high comfort levels in discussing PA with patients with an average of 4.1 points on a five-point scale. This is similar to a study that found that the physician confidence in counseling solid organ transplant patients about PA was 2.8 points of confidence on a 4-point scale where 0 points is not confident and 4 points is very confident (Pang et al., 2018). There was a lower average comfort level in the post-educational session survey results with an average of 3 points on a five-point scale. This shows that the post-educational session group was "somewhat comfortable" discussing PA with patients. The lower levels of comfort discussing PA may be from understanding that discussing PA with patients may be difficult realistically. The reason for the medium-high comfort levels of the Wellness Center population is not apparent as it disagrees with the study that looked at confidence in PA counseling, which found that there is a positive relationship between knowledge about PA and confidence levels discussing PA with patients (Pang et al., 2018).

The high levels of PA and increased knowledge in PA guidelines in the post-educational session group may indicate that the informational presentation had a positive effect on people that viewed the presentation.

A major strength of this study is that ACSM EIM-OC is only implemented in 12 small, private, Christian liberal arts schools, two of which, Biola and Azusa Pacific University, are located in southern California (*EIM On Campus - Exercise is Medicine*, 2023). Since there is limited available research regarding this niche population, this study contributes to the literature. Also, while studies have been conducted on healthcare provider knowledge of PA guidelines, the literature is limited, so this study can aid in understanding this topic.

The informational presentation was well received initially. The audience commended the presenters for offering insight into the importance of PA. After the presentation, two student workers who are nursing students requested access to the presentation slides because they were interested in sharing information on this topic for a project for their community health class. Additionally, the director of PLNU's Wellness Center thought that the team initiating the ACSM EIM-OC should address a request by the PLNU newspaper regarding information on the benefits of exercise and drawbacks of not engaging in exercise.

There are several challenges in interpreting the results of this study. One difficulty in interpreting the results is that eight of the twenty-three participants of the pre-educational session questionnaire had left at least one question unanswered. This may be due to a lack of incentive to respond to questions or feeling pressed for time. In addition, the small sample size of the population makes any outliers or irregularities impactful. Also, the demographics of the population are not known besides the specific positions of the population. This was due to a desire to maintain the anonymity of the participants being that the PLNU Wellness Center staff is small, therefore, this de-identification choice was made. Another reason for this choice was to encourage participant response by shortening the questionnaire. A limitation of this study is that the intensity (moderate or vigorous) of the PA was not specified because the aim of the question was to minimize influence on the answering of the question regarding the PA Guidelines for Americans. This impacted two of the responses which gave an estimate of their PA levels between 75-150 minutes of weekly PA. These participants may have reached PA guidelines if they engaged in at least some amount of vigorous intensity PA, but this would be insufficient if all of the time was spent at moderate-intensity exercise. It may have been worth having a question in the survey to ask whether or not their levels of PA have changed since viewing the

presentation one month earlier. This would have helped determine whether the presentation informed them on the importance of incorporating PA into their weekly schedule, especially adequate PA.

As with any research study, conclusions drawn from the results of this study are specific to the population on which the study was conducted on (namely, healthcare providers in southern California). Compared to the national PA rates of 46.9% of adults meeting aerobic PA minimums, the participants that completed the pre-educational session survey had a higher aerobic PA rate of 65.2% and the participants that completed the post-educational session survey had a higher aerobic PA rate of 100% (Elgaddal et al., 2022). This shows an incongruence between the national rates of PA and the participants' rates of PA, which may limit the generalizability of the results. This can be related to how California is more physically active than the rest of the U.S. population as 70.5% of California residents meet aerobic PA guidelines as compared to 46.9% of the U.S. population (Elgaddal et al., 2022; *Nearly 25 percent of adults say they aren't physically active*, n.d.).

While there are several next steps to take at PLNU, one important step is implementing interactive approaches that are sensitive to the existing emotional stigmas surrounding obesity, weight, and PA. One systematic review and meta-analysis of studies conducted between 1989 and 2020 found that healthcare professionals exhibit implicit and explicit weight bias against people who are overweight or obese (Lawrence et al., 2021). When people perceive that they are judged for their weight, they are less likely to successfully lose weight. One study found that overweight individuals that discussed weight loss with their primary care providers were more likely to lose weight if they perceived that they were not judged for their weight than those who perceived that they were judged for their weight (Gudzune et al., 2014). Since the

patient-provider relationship is crucial to patient health outcomes, it is important to consider moving forward with promoting PA to student patients in a sensitive manner. The PA promotion at PLNU currently does not have any support in place regarding this, but it could become an important concern.

Some other next steps include maintaining the ACSM EIM-OC program at PLNU by partnering with PLNU's Kinesiology Society, an undergraduate student club, to create student EIM representative positions, which would promote PA on campus. Currently, discussions with this club are underway. Since this study showed a continued insufficient knowledge of PA guidelines, an annual training of Wellness Center employees would be beneficial, so that correct knowledge of PA guidelines can be promoted in patient interactions. This annual training could be held by future EIM representatives. Now that the EIM-OC program has been established, the goal should be campus-wide promotion of PA focusing on its benefits for all.

Conclusion

The results of this study show that the knowledge of PA Guidelines for Americans among PLNU Wellness Center staff is currently lacking. While the healthcare providers may have confidence in discussing PA, their lack of knowledge of the specific PA guidelines poses issues in encouraging sufficient amounts of PA to patients. This study has been helpful in understanding the PLNU Wellness Center's current staff knowledge of and confidence in recommending PA guidelines to patients, and showed how guideline education is needed in this population of healthcare providers. We did not focus on specifics regarding how to approach PA promotion in this study. Instead, we educated participants on the guidelines, surveyed their current activity levels and knowledge of guidelines, and assessed their confidence in discussing PA with patients. The informational presentation to the Wellness Center employees received a positive reception

and sparked further interest in the importance of PA and how PA can be promoted across the PLNU campus. Participants who completed the survey after viewing the presentation indicated they had become more knowledgeable about the guidelines and many significantly increased their own PA levels after viewing the presentation, which may have been a result of that presentation.

Increasing the PA levels of the students at PLNU at least up to minimum guidelines will be a process. Ideally, the entire Wellness Center staff would embrace the EIM movement at PLNU to accomplish this goal. The continuation of the EIM-OC program at PLNU is crucial to equipping the healthcare providers, whose goal is to promote healthy lifestyles to students, with knowledge to promote the guidelines to students. With the program in place for students to learn about why it is important to integrate adequate PA into their lives and how to accomplish it, a greater proportion of students is expected to meet PA guidelines over time. Not only is this important for PLNU specifically, but other schools, especially small, private, Christians liberal arts schools, can also learn how to integrate EIM-OC so that they too can increase student participation in sufficient PA.

The next step is to increase the proportion of providers that are both knowledgeable about PA guidelines and confident in sharing, during patient encounters, the benefits of PA, especially PA as a preventative "medicine." A regular - annual or even more frequently - EIM presentation reiterating the PA guidelines, sharing current research on PA, and opening up discussions on ways to promote PA, to the PLNU Wellness Center employees would expand the knowledge and confidence of the providers to share PA guidelines. In addition to being educational, the presentation should be persuasive, in order to convince the healthcare providers to share, out of conviction, evidence-based reasons for engaging in PA, such as preventing health issues from

arising and mitigating physical and psychological disease severity. This presentation should be interactive, for example, post presentation, breakout sessions can be held to share ideas on how to increase PA for all involved. Another potentially helpful tool is to provide a physical handout about the guidelines, as a staff reminder, which can also be posted in each treatment room as a further reminder. With the addition of a regular EIM presentation to the Wellness Center staff, we can expect to see positive physical, social, and psychological health changes not only within the PLNU student body but also in the Wellness Center staff.

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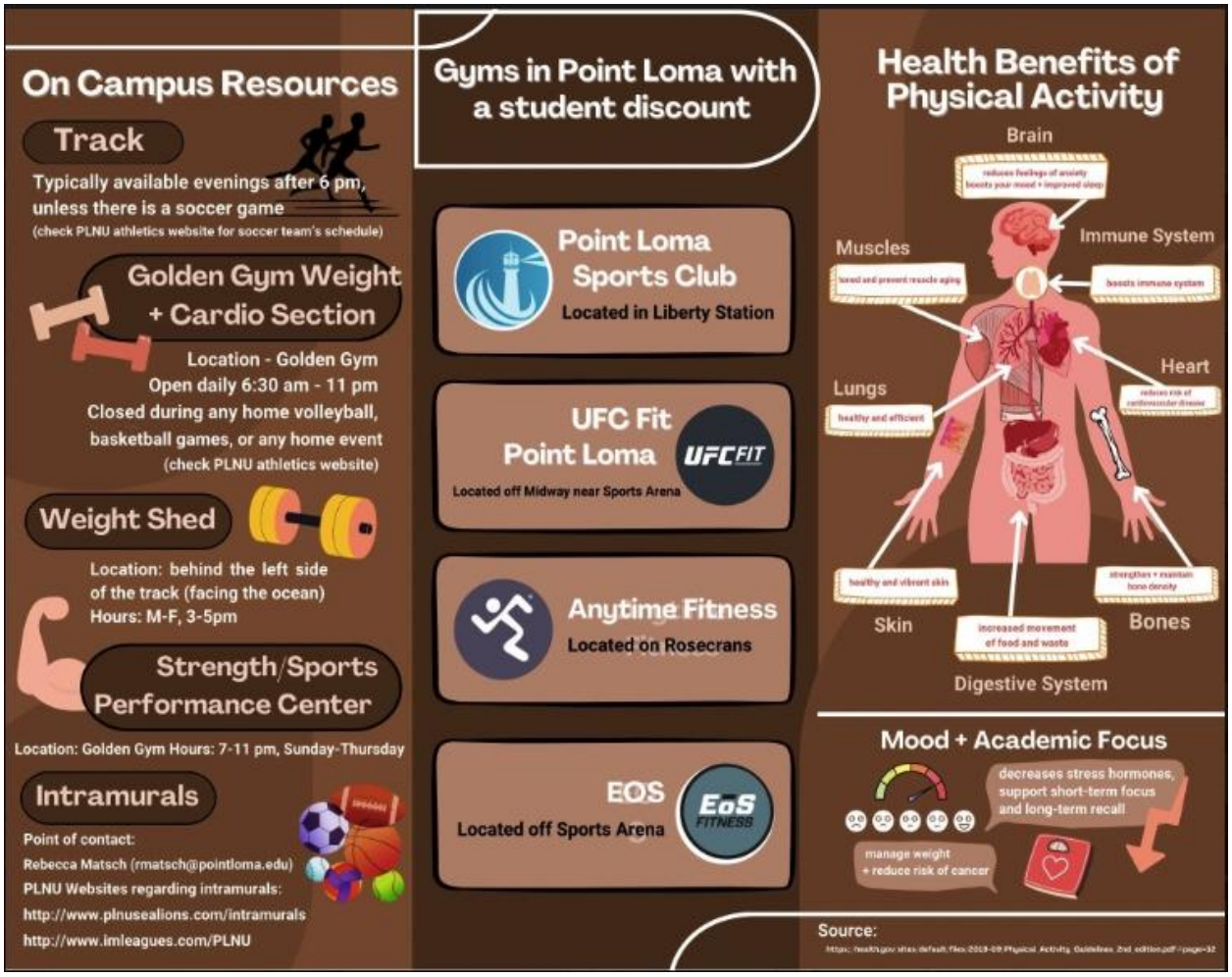
Appendix A

Pamphlet in Collaboration with Wellness Center



Appendix B

Survey the Wellness Center Employees Completed

What is your position at the Wellness center? (select option)
Do you currently exercise? (select option)
If yes, about how many minutes per week? (fill in the blank)
If yes, do you participate in strength training? (select option)
If yes, how many days per week? (fill in the blank)
Do you know what the current Physical Activity Guidelines for Americans are? (select option)
At least how many minutes of moderate intensity physical activity per week are recommended? (fill in the blank)
Alternatively, at least how many minutes of vigorous intensity physical activity per week are recommended? (fill in the blank)
Additionally, at least how many days per week is total body strength training recommended? (fill in the blank)
On a scale of 1-5 (1: least comfortable, 5: most comfortable), how comfortable are you discussing physical activity with your patients? (select option)