USE AND PERCEPTIONS OF ONLINE AND VIRTUAL EXERCISE TRAINING DURING THE COVID-19 PANDEMIC

By

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ABSTRACT

The coronavirus-19 (COVID-19) pandemic forced fitness centers to close due pandemic restrictions. Online and virtual exercise training provided a manner of addressing physical fitness needs in a guided format. Using an online survey, the studies in this dissertation provided an overview of what motivated people to participate in online and virtual training and the costs of participation and equipment during the COVID-19 pandemic. Secondly, the goals, barriers, and modes of participation in online and virtual training were examined.

The first study showed greater participation in online and virtual training during March 2020 – February 2021 compared to March 2019 – February 2020 ($p < .001$). Participants were more motivated to use this training due to cost per session ($p = .004$), less travel ($p = .008$), more flexible schedules ($p = .021$), classes not available at local fitness centers ($p = .001$) and being more comfortable exercising from home ($p < .001$). Participants were willing to spend more on online and virtual fitness training during March 2020 – February 2021 compared to when there is a post-pandemic state ($p = .011$).

In the year before the pandemic and the first year of the pandemic, participation was greatest in yoga, body weight, and high intensity interval training (H.I.I.T.) classes. The most selected goals were to improve overall heath, tone muscles, and lose weight, with lose weight ($p = .001$), tone muscles ($p = .039$), reduce fat mass ($p = .013$), improve overall health ($p = .039$), and improve muscular strength ($p = .035$) showing significantly lower goal achievement. Participants also desired less expensive online streaming classes compared to pre-recorded classes ($p = .004$).

Exercise professionals should consider the factors that motivated clients the most to take classes, such as, cost of sessions, less travel, flexibility in schedules, and being able to exercise from a client's home. Exercise professionals using online or virtual training should create classes using yoga, body weight or H.I.I.T. classes, while focusing on improving overall health, toning muscles, and weight loss as primary goals.

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CHAPTER I

DISSERTATION INTRODUCTION

Physical activity is defined as any bodily movement produced by skeletal muscles that results in an expenditure of energy (Casperson et al., 1985). Physical activity has numerous health benefits such as decreasing all-cause mortality, cardiovascular disease, cancer, type 2 diabetes, and disease risk factors (Piercy et al., 2018). Despite the benefits, 31.1% of American adults report being physically inactive (Hallal et al., 2012). The Coronavirus-19 (COVID-19) pandemic created boundaries for many people to access areas where they would have been physically active. During the COVID-19 pandemic physical activity decreased by 33.5-41% (Ammar et al., 2020; Wilke et al., 2021).

The COVID-19 pandemic began when a strain of coronavirus was recognized in Wuhan in the Hubei Province of China in December of 2019 (Li et al., 2020; World Health Organization [WHO], 2020). By January 30, 2020, the WHO declared a public health emergency over the outbreak, and as of April 12, 2021, there have been 136,493,176 global cases with 2,944,366 deaths (John Hopkins University and Medicine, 2021; WHO, 2020). Additionally, there have been new variants emerging that are more transmittable and need a greater number of antibodies to prevent infection creating further issues over the transmission of the virus (Collier et al., 2021).

Due to safety guidelines, gyms, health clubs, and fitness centers were forced to close during stay-at-home orders. This forced many changes in the health and fitness industry that once serviced 73 million patrons (International Health, Racquet &

Sportsclub Association [IHSRA], 2021). Approximately 6,800 health clubs have permanently closed for business and 1.4 million jobs have been lost in the industry in total (IHSRA, 2021). Fitness centers needed to find a new way to produce income to prevent their facilities from having to permanently close. To do this, gyms began to rent out equipment, offer online programs, and/or move to outdoor facilities to offer fitness classes (Kercher et al., 2020).

For clients, online training and virtual training became more popular during the COVID-19 pandemic (Bratland-Sanda et al., 2020; Godefroy, 2020; IHRSA, 2021; & Weddel, 2020). Online training allows an individual to train at-home by participating in live streaming or prerecorded exercise sessions. Virtual training is similar and can occur through prerecorded online classes, or through other offline technology-based programs that allow participation in group sessions. These options provided opportunities for people to choose and to stream or download classes from personal trainers of their choosing while social distancing at home.

Online and virtual training can provide a mode of physical activity for people. However, it is a new and emerging concept in the health and fitness industry and contains potential risk to clients (Abbott, 2016). When performing online and virtual training, the ability to provide direct supervision over clients is not always available. The client may have poor mechanics, perform potentially dangerous movements, improperly load an exercise, fail to use a spotter, or misunderstand the instructions, potentially increasing the health and injury risk to clients (Abbott, 2016 & Riley & Schroder, 2005).

Research on methods to improve the application of online and virtual training is limited. There have been studies investigating the use of online and virtual training in

musculoskeletal conditions (Bennell et al., 2017; Jansen-Kosternik, 2015), pulmonary diseases (Hansen et al., 2017; Jansen-Kosternik, 2015; Liu et al., 2013; Tsai et al., 2017), rheumatoid arthritis (Srikesavan et al., 2020), and elderly populations (Baez et al., 2016; Hong et al., 2018; Wu et al., 2010) with positive outcomes. However, research on the healthy, general population is limited, and should be investigated further to determine how to provide exercise training and coaching efficiently and safely through these methods.

Overall Purpose

The purpose of the first study in this dissertation was to determine changes in participation of online and virtual training during the COVID-19 pandemic, the convenience and effectiveness of its use, and the cost effectiveness of the training. The purpose of the second study was to determine the types of sessions used during online and virtual training, and the settings that created the best outcomes and client experiences to allow clients to reach their fitness goals.

Significance of Studies

With online and virtual training becoming an emerging field in the health and fitness industry, there is a need for researched and developed practice. By determining the use of online and virtual training, the perceived cost-effectiveness, and the types of training clients are participating in there can be a better understanding of the marketing and industry demands around online and virtual training. While investigating the client's fitness goals, determining the best methods and experiences to reach these goals can help develop the best online and virtual training sessions to improve client satisfaction, health, and fitness levels.

CHAPTER II

REVIEW OF THE LITERATURE

The purpose of this literature review is to detail online and virtual training during the COVID-19 pandemic. The chapter begins with an introduction to physical activity. Next, COVID-19 and the global impact created by the COVID-19 pandemic. The impact on the health and fitness industry due to the COVID-19 pandemic is examined. Next, the fitness trends during the COVID-19 pandemic including online and virtual training and the limitations of online and virtual training. The current research using online and virtual training is then discussed. The chapter ends with a final summary and a review of the purpose of the dissertation studies.

Physical Activity

Physical activity is defined as any bodily movement produced by skeletal muscles that results in an expenditure of energy (Casperson et al., 1985). In the *Physical Activity Guidelines for Americans*, it is recommended adults obtain at least 150-300 minutes a week of moderate-intensity, or 75-150 minutes a week of vigorous intensity aerobic physical activity, and 2 or more days a week of muscle strengthening activities involving all major muscle groups (Piercy et al., 2018). Participating in physical activity can decrease all-cause mortality, cardiovascular disease, cancer, type 2 diabetes, and risk factors for diseases such as obesity, hypertension, and high blood cholesterol (Piercy et al., 2018). Being physically inactive is attributed to 8.3% of deaths in adults aged 25 and older (Carlson et al., 2018). Despite these benefits, 31.1% of adults worldwide are

physically inactive, and 19-26% of American adults report meeting aerobic and muscle strengthening guidelines (Hallal et al., 2012). In a 14-nation survey by Wilke et al. (2021), participants averaged 450.1 minutes of moderate to vigorous physical activity per week. Due to restrictions during the COVID-19 pandemic this number decreased by 41% to 265.8 minutes per week. Similar to the international survey from Ammar et al. (2020), where participants decreased by 33.5% minutes per week showing unhealthy changes in participants lifestyle behaviors.

Coronavirus-19 (COVID-19)

Coronaviruses are enveloped, positive, single-stranded, large ribonucleic acid viruses (Velavan & Meyer, 2020). Coronaviruses spread during close contact through airborne transmission of respiratory droplets or contact with contaminated surfaces. Respiratory droplets can remain in the air from minutes to hours and are derived from coughing, sneezing, talking, or simply breathing (CDC, 2020a). In December of 2019, a strain of coronavirus was recognized in Wuhan in the Hubei Province of China (Li et al., 2020; WHO, 2020). On January 30, 2020, the WHO declared a public health emergency of international concern, the WHO's highest level of alarm, over the outbreak of COVID-19 (WHO, 2020).

As of April 12, 2021, the John Hopkins Coronavirus Resource Center reported 136,493,176 global cases with 2,944,366 deaths (John Hopkins University and Medicine, 2021). The current total of cases exceeds previous coronavirus outbreaks, such as the severe acute respiratory syndrome coronavirus (SARS-CoV) that emerged in 2002 and the Middle East respiratory syndrome coronavirus (MERS-CoV) that emerged in 2012 (Cherry, 2004; European Centre for Disease Prevention and Control [ECDC], 2021). The

SARS-CoV developed in 8,096 people with 774 deaths between November 2002 and July 2003. As of January 12, 2021, there were 2,581 reported cases of MERS-CoV and 935 deaths (Cherry, 2004; ECDC, 2021). The current outbreak of COVID-19 has developed additional variants of the virus. Three new variants of COVID-19 that are spreading include, B.1.1.7 first identified in the United Kingdom, B.1.351 first identified in South Africa, and B.1.1.28, also known as P.1, first identified in travelers from Brazil (CDC, 2021a). As of April 10, 2021, there are 21,865 confirmed cases of the variants, with 20,915 of those from the B.1.1.7 variant (CDC, 2021a). All three variants of COVID-19 have shown the E484K mutation (Public Health England, 2021). The E484K mutation of COVID-19 creates a virus that is more transmittable and needs a greater number of antibodies to prevent infection of cells (Collier et al., 2021). The health care systems are already stressed in America, with a reported 32.2% of intensive care units at 90% or greater occupancy during the week of January 29 – February 4, 2021 (University of Minnesota Hospitalization Tracking Project, 2021). The new variants of COVID-19 may lead to a greater number of infections and deaths and create even more strain on the already stressed health care system.

Symptoms of COVID-19 can present in patients through a fever, cough, or shortness of breath, with other possible symptoms including chills, myalgia, headache, fatigue, and gastrointestinal symptoms (Burke et al., 2020). However, patients can also be asymptomatically infected with COVID-19. In a meta-analysis conducted by He et al. (2021), of 50,155 patients with confirmed COVID-19 infection, 15.6% were asymptomatic. In children, this proportion was even higher with 27.7% of cases being asymptomatic. This leads to concern that individuals who present as asymptomatic or are

pre-symptomatic may unknowingly transmit the disease. It is estimated that 59% of all transmissions come from asymptomatic individuals, with 35% being pre-symptomatic and 24% from asymptomatic individuals (Johansson et al., 2021).

With the new variants of COVID-19, and the large portion of transmissions coming from individuals that are pre-symptomatic or asymptomatic, it is important to promote the need for mask wearing, hand washing, and social distancing to reduce infection rates (Chughtai et al., 2020; Doung-ngem et al., 2020). However, in order to appropriately apply social distancing guidelines and decrease transmission of COVID-19 many businesses have been forced to close or minimize the number of patrons they allow into their establishments creating financial stress. One industry impacted world-wide by closures is the fitness industry. At this time, many countries have limited the capacities of gyms, while a portion still have gyms completely restricted (Fisher, 2021).

COVID-19 and the Health and Fitness Industry

The COVID-19 pandemic has forced changes in many aspects of the health and fitness industry. Prior to COVID-19, the U.S. fitness industry serviced 73 million gym goers with the greatest membership enrollment coming from people aged 21-40 years old (IHSRA, 2021). The fitness industry consisted of an estimated 3 million employees at 40,000 health clubs where monthly membership fees averaged $52 in 2020 (IHRSA, 2021). As of December 31, 2020, approximately 6,800 health clubs have permanently closed for business and, in total, 1.4 million jobs have been lost in the fitness industry in America because of the COVID-19 pandemic (IHRSA, 2021).

When state mandated stay-at-home orders began, gyms were one of the first businesses forced to close doors to clients and were some of the last businesses permitted

to re-open. To open, new state requirements related to cleaning and client access needed to be met. The CDC safety guidelines included wearing face masks, social distancing, COVID-19 screening, temperature checks, and recording check-in and check-out times of clients (CDC, 2020b; CDC,2021b). Some gyms were able to meet these guidelines while others were forced to modify business hours or create appointment-only sessions to facilitate the health and safety precautions (Meyers et al., 2020). One physical addition the CDC (2020b) recommended to decrease the spread of infection was the use of cleanable shields or barriers to keep employees and clients separated when distancing could not be physically accomplished. A low-cost alternative to installing these barriers was to create "workout pods" with shower curtains and pipes to maintain barriers between individuals (Kubota, 2020). Additional CDC safety recommendations included removal of equipment that is difficult to clean such as bands, rubber mats, foam rollers and yoga blocks, limiting access to locker rooms to be restrooms only, and closing water stations or water fountains (CDC, 2020b). While these modifications and measures are aimed at keeping people safe, limiting available equipment, mandating use of barriers, decreasing space available for patrons, and limiting capacity at facilities also poses deterrents to gym members, limiting the patrons returning to gyms, health clubs, and fitness centers.

In the United States, the Coronavirus Aid, Relief, and Economic Security (CARES) Act assists small businesses such as fitness centers, by pausing the payment of payroll taxes, establishing a bridge loan facility, and creating lending and grants for small business (U.S. Chamber Staff, 2020). While the CARES Act can help financially supplement a fitness center to stay open, locating additional sources to generate income

and maintain clientele are still vital. One example of outside thinking is in Australia where health care facilities began renting out equipment, offering online programs, and/or moving to outdoor facilities to offer classes (Kercher et al., 2020). Recent trends show ways in which fitness facilities have tried to minimize the financial impact of COVID-19, as well as how consumers are trying to find ways to be physically active.

Fitness Trends During COVID-19

The ACSM conducts a survey of fitness professionals around the world to assess their views on trends in the health and fitness industry (Thompson, 2021). In the ACSM's *Worldwide Survey of Fitness Trends* 2020 survey, outdoor activities were the 13th ranked trend and online training the 26th ranked trend (Thompson, 2019). In contrast, the ACSM *Worldwide Survey of Fitness Trends* 2021 survey, showed online training, outdoor activities, and virtual training as three of the top six trends in 2021, with online training being the number one trend (Thompson, 2021). This was the first-time virtual training appeared on the list since being classified as a separate distinction from online training (Thompson, 2021). According to Google Trends, the search for "online exercise classes" reached their highest recorded search rate from April to May 2020, since data began being collected in 2004 (Google Trends, 2021).

Online Training

Online training allows for a person to train at-home in individual or group sessions and can be live streaming or prerecorded. In accordance with ACSM's *Worldwide Survey of Fitness Trends*, there is further evidence the use of online training increased during the COVID-19 pandemic (Bratland-Sanda et al., 2020; Godefroy, 2020; IHRSA, 2021; & Weddel, 2020). A survey conducted in Norway showed personal

trainers were offering three times as many online training sessions during lockdown compared to pre-COVID-19 lockdown (Bratland-Sanda et al., 2020). According to an Australian survey, the most popular methods of online training were streaming services with 41.3% of users, facilitated online classes with 30.5% of users, and subscriber fitness programs with 24.0% of users (Parker et al., 2021). Another view of the changes in the fitness industry can be seen by looking at the use of The Mindbody application. This program allows fitness professionals to host classes through live streaming or pre-recorded classes. Prior to COVID-19, in the Mindbody application, 17% of users participated in pre-recorded streams of classes and 7% participated in live-streamed classes to workout. During the COVID-19 pandemic, the percentages increased, with 70% using pre-recorded classes and 75% using the live streaming services to workout (Weddle, 2020). Based upon the IHRSA in 2020, one out of five members of a gym, health club, or fitness studio also pay for an online fitness service, such as the Mindbody application, and 68% that began using an online service during the COVID-19 pandemic plan to continue using the service in the future (IHRSA, 2021). These data demonstrate the potential demand for continued use of online training in the fitness industry post-pandemic, but it is unknown how many individuals are aware of the various capabilities of online training (IHRSA, 2021).

With online training there are many streaming services available such as YouTube, Instagram, Facebook, or Zoom, for group and individual exercise programs. Using online training provides benefits such as privacy, reduced travel, and convenience. When using online training, a client can be in their own home or preferential setting where they feel most comfortable exercising. There is less worry about what one is

wearing, and decreased intimidation or insecurities from the other members of a gym or group fitness class. With online training there is no need to travel to a fitness center and, if a client or their personal trainer is out of town or not in a close location to their fitness center, they can still maintain a relationship (Abbott, 2016). A client can participate in classes regardless of their physical location. The convenience of online training allows for someone to reserve a spot or drop into the class of their choosing when it fits their program and allows a more flexible schedule, if necessary. Furthermore, online classes do not always require a long-term commitment of a membership contract. The cost for individuals can be reduced in classes in certain group settings, where the cost of personal training can be spread out among group members (Abbott, 2016). There is also the ability to take classes online for free and classes that only charge a fee per individual class to decrease the monetary commitment.

Virtual Training

Virtual training is a method of online training, and commonly the terms virtual training and online training are used interchangeably. However, the ACSM recently separated the terms online training and virtual training. The ACSM defined virtual training as, "the fusion of group exercise with technology offering workouts designed for ease and convenience to suit schedules and needs" (Thompson, 2021, p. 15). While online training involves technology, it is based upon using an online service to distribute the classes. Virtual training can be distributed through online services, but can also be used through offline methods as in 1951, when the earliest form of virtual training began. In 1951, Jack LaLanne began hosting *The Jack LaLanne Show*. The television show consisted of LaLanne engaging viewers and leading them through exercise programs.

Virtual training in the 21st century is typically a form of training where pre-recorded workouts are played on screens in gyms that allows for smaller class sizes and for groups to work at their own pace (Thompson, 2021). Virtual training can be a form of online training where a person participates in pre-recorded classes through an online streaming service, or as we typically see, uses other offline technology-based programs that allow a person to participate in group sessions. During COVID-19, virtual training transitioned to being performed in people's homes. Instead of streaming live classes in the same way as online training, someone can download pre-recorded group classes from personal trainers of their choosing and participate in classes while at home. Virtual training can help promote real time online training and get users involved in synchronous classes.

Currently NASM has a virtual coaching specialization geared towards educating a certified personal trainer to administer and implement assessments and coaching sessions through an online platform (NASM, 2020). The recent development of this specialization follows along with trends in the health and fitness industry (Bratland-Sanda et al., 2020; Godefroy, 2020; Google Trends, 2021; IHRSA, 2021; Thompson, 2021; & Weddel, 2020). As online and virtual training become more popular in the health and fitness industry, it could prove beneficial for businesses to develop an online presence and a form of internet-based training to provide clients. This initial specialization is a great start for someone who wants to get into or transition to online or virtual training, but there is limited work on best practices for the techniques and there is a need for continued and further research in the field.

Limitations with Online and Virtual Training

Although online and virtual training come with clear benefits, the risk of potential injury could be increased with a lack of supervision in online and virtual training (Abbott, 2016). Without direct supervision, a personal trainer cannot correct poor mechanics or potentially dangerous ranges of motion through an exercise movement. If there is weight involved, a personal trainer cannot set and adjust loads, or make sure there is proper spotting with exercises (Riley & Schroeder, 2005). To minimize potential risks involved and improve safety, it is recommended that personal trainers maintain periodic meetings and ensure proper communications and clear, easily understood instructions while coaching a client (Abbott, 2016). A potential concern is how and where people acquire information on exercises and fitness related topics. In a study by Godefroy in 2020, when analyzing online training through Instagram, certified fitness coaches focused more on maintaining correct postures and stating the target audience for each training session to reduce injury risks, when compared to online training through Instagram influencers who were not fitness training professionals.

Online and virtual training are new and emerging concepts in the health and fitness industry. Currently, there have been studies using online exercise prescription in musculoskeletal conditions (Bennell et al., 2017; Jansen-Kosternik, 2015), pulmonary diseases (Hansen et al., 2017; Jansen-Kosternik, 2015; Liu et al., 2013; Tsai et al., 2017), rheumatoid arthritis (Srikesavan et al., 2020), and elderly populations (Baez et al., 2016; Hong et al., 2018; Wu et al., 2010) that have shown positive results. However, research on the healthy general populations is limited. This causes a concern as the ACSM trends

have online and virtual training as two of the top six expected trends of 2021 (Thompson, 2021).

Current Research

Bennell et al. (2017) conducted a study with patients > 50 years old with chronic knee pain. Participants were put into groups, with one group participating in virtual exercise training with pain-coping skill training, and the other receiving educational materials on exercise, physical activity, healthy eating, pain management, medication, complementary therapies, and emotions. The virtual training consisted of 8-weekly modules, prescribed to be done 3 times per week, and consisted of personalized leg-strengthening exercises with instructions and demonstrations. Participants in this group also partook in seven Skype sessions over a 12-week period in addition to the virtual training. The virtual training group showed decreased pain during walking and increased physical function over a three-month period when compared to patients with educational materials alone. In months three to nine of the study, the effects of the internet-delivered exercise with pain-coping skills training decreased in effectiveness while the educational materials alone did not show the same decrease. One theory by the authors, as to the decrease in effectiveness, could be the lack of real-time contact with the physiotherapist after the 12-week period of Skype sessions (Bennell et al., 2017).

Patients with both chronic lower back pain (CLBP) and pulmonary diseases were treated using a mixed telerehabilitation and traditional rehabilitation program and compared to a group that received only the traditional rehabilitation program where they visited the clinic three times per week. The mixed telerehabilitation group used virtual training to complete their exercises, where they were given a database of prerecorded

videos of the exercises for their rehabilitation. Virtual training began in the third week of rehabilitation for the CLBP patients and in the fifth week for pulmonary disease patients. The program lasted 5 weeks for the CLBP group and 7 weeks for the pulmonary disease group. In the intervention group, 70% of participants showed a clinically relevant improvement in pain whereas 43% of the control participants had a clinically relevant improvement in pain. Pre-test to post-test changes in physical conditioning and disability status were not significantly different between groups. Disability status was measured through the Rolland Disability Questionnaire for the CLBP group, and Chronic Respiratory Questionnaire for the pulmonary disease group. Physical conditioning was measured using an Åstrand ergometer bicycle test for the CLBP group and the 6-minute walk test in the pulmonary disease group. Within the intervention groups, two-thirds of the patients rated the virtual exercise based telerehabilitation service with a 6 or higher on a scale from 0 to 10 on satisfaction (Jansen-Kosternik, 2015). While disability and physical conditioning levels did not improve, the intervention group showed decreased pain levels and a relatively high rating on satisfaction of the service.

Hansen et al. (2019) also studied online training with individuals with pulmonary disease. Participants with a clinical diagnosis of chronic obstructive pulmonary disease (COPD), were randomly put into groups to receive pulmonary telerehabilitation or traditional pulmonary rehabilitation. The telerehabilitation group performed online training three times a week for 10 weeks, with each session lasting 35 minutes. The training consisted of high repetition, time-based muscular endurance training. The traditional pulmonary rehabilitation group was a group-based session twice a week for 10 weeks that lasted 60 minutes per session. The 6-minute walk test distance was assessed

pre- and post-intervention. There were no statistically significant differences between groups, but each group had a statistically significant improvement in the 6-minute walk distance after the intervention as compared to pre-intervention. While there was not a significant difference between groups on the 6-minute walking distance, improvement was shown in the online training group and they were able to maintain their improvements through the 22-week follow-up (Hansen et al., 2019).

In another investigation of individuals with COPD, Liu et al. (2013) randomized participants diagnosed with COPD into a virtual training group or a control group. The intervention group partook in virtual breath training consisting of audio and video instructions leading them through the training protocol. The control group received handouts with pictures of the exercises with advice on how to perform the exercises. Each group participated in the trainings for four months. There was a significant difference in adherence to the programs between groups. The intervention group had 86.2% of participants perform trainings regularly whereas the control group had 50.0% of the participants perform the trainings regularly. A 6-minute walking distance was used to measure exercise capacity. The virtual training group showed improvements by 74.6 meters in the test and the control group decreased by 5.8 meters (Liu et al., 2013). While not only documenting statistically significant increases in exercise capacity in participants, there was also a documented increase in adherence to the program with those in the virtual training group. Therefore, when prescribing at-home training sessions, using virtual training can be a more effective method than only handouts.

In a study by Tsai et al. (2017), participants diagnosed with COPD used online training to perform rehabilitation. The online training group included group rehabilitation

sessions with 4 participants in each group session. In each class, participants would be involved in lower limb cycle ergometry, walking training, and strengthening exercises. The study lasted eight weeks and required participants to participate in sessions three times a week. The online participants were compared to the control group who received usual medical management with no required exercise training. The study assessed participants exercise capacity using the 6-meter walk test, incremental shuttle walk test, and the endurance shuttle walk test.

There were significant improvements in 6-meter walk test and endurance shuttle walk test from pre-test to post-test in the online training group, and significant improvements in the endurance shuttle walk test between the online training group and the control. There were no improvements in the incremental shuttle walk test within the online training group or between groups. In measurement of daily physical activity, measured by an accelerometer, there were no significant differences within the online training group or between groups. This study shows improvements in two of the three walking tests provided within the online training group, but only significant improvements between groups in the endurance shuttle walk test. This does seem concerning to the effect of online training. However, it does show that online training does lead to improvements even though all were not statistically significant. There were no improvements in daily physical activity within or between groups, which lead the authors to conclude that in patients with COPD, online exercise training may not be enough to develop a daily habitual physical activity (Tsai et al., 2017).

In a study conducted by Baez et al. (2016), participants > 65 years old participated in virtual training using the Gymcentral Trainee Application. This application is designed

to allow older adults to partake in virtual exercise training groups where avatars are used for the members of the group session. This study consisted of two groups, with the first using a version of the application that focused on the home-based program without having social or individual persuasion features in the application. The second group received a version of the application that included a personalized training program, social environment for group exercising, messaging, and persuasion features. The program for each group consisted of muscle strengthening and balance-retraining exercises, with each session lasting 30-40 minutes. The training lasted 8-weeks and participants were required to participate in a minimum of two exercise sessions per week. Participants were assessed for leg muscle strength, gait speed, enjoyment of physical activity, subjective wellbeing, and loneliness. Leg muscle strength was measured by 30 second Chair Stand scores, gait speed by Timed Up & Go scores, enjoyment of physical activity through the Physical Activity Enjoyment Scale, subjective wellbeing through the Multidimensional Personality Questionnaire, and loneliness through the R-UCLA loneliness scale. There were no statistically significant differences between the groups in pre-test to post-test scores of leg muscle strength, gait speed, enjoyment of physical activity, subjective wellbeing, or loneliness. However, both groups showed statistically significant improvements from pre-test to post-test in all five assessments. While the social aspect of the Gymcentral Trainee App did not have a significant effect study outcome, the virtual training did lead to improved leg strength and gait speed in both groups (Baez et al., 2016).

Wu et al. (2010) compared face-to-face group exercise training to virtual and online exercise training in community-dwelling participants over the age of 65 years who

were at risk for falls. Each group received the same exercise curriculum from the same instructor. The exercise program contained a 24-form Yang-style Tai Chi Chuan sequence involving turning, weight shifting, leg bending and unbending, single-leg standing, and upper body movements. The participants were instructed to participate in the exercise sessions 3 days a week for 15 weeks, with each session lasting 1 hour. Within the virtual training group there were 9 dropouts due to lack of interest, whereas there were no dropouts due to lack of interest in the other two groups.

The study found a significant reduction in the mean number of falls in the online and face-to-face groups compared to the mean number of falls in the previous year, and no significant difference in falls of the virtual training group. However, fear of falls significantly decreased in all groups. Single leg stance improved in all groups but was not statistically significant in the virtual training group. Timed up and go scores were not significantly different from pre-test but did improve in the online and face-to-face groups. Body sway during quiet stance was measured with eyes opened and eyes closed. In both tests, the online and face-to-face groups showed improvements whereas the virtual training group did not improve in either test. It was unclear if the 9 dropouts from the virtual training group was due to lack of interest in the method of delivery or the type of exercise being prescribed, but it is a concerning when compared to the other groups who had no dropouts with the same instructor. Overall, there was the least improvement in the virtual training group when comparing pre-test scores to post-test scores, and post-test scores of body sway were the lowest of the three groups. The online training participants improvements were comparable to face-to-face training. It was concluded that online

training could be used as a future method to provide exercise training to those in this population who are unable to attend face-to-face classes (Wu et al., 2010).

Hong et al. (2018) studied a similar population. The researchers studied community dwelling elderly women above 65 years old to assess the effects of online training on physical function. The control group received no exercise training intervention, nutrition and exercise advice once every four weeks, and an activity and nutrition level check once every two weeks. The online training group received online exercise training, with the same amount of nutrition and exercise advice and activity and nutrition level checks. The online training included three exercise sessions per week for 12 weeks. Each session lasted 20-40 minutes. The main exercises performed consisted of resistance and balance exercises using resistance bands and a chair, targeting the major muscles of the shoulder, arms, thighs, hips, and calves. Exercises consisted of 8-15 repetitions per set with the same instructor for all participants. To test for physical function participants were assessed on the Senior Fitness Test (SFT) and Berg Balance Scale (BBS). The SFT consisted of 2-minute step, chair stand, arm curl, chair sit-and-reach, back scratch, and 8-foot up-and-go tests. There was a significant difference between pre-test and post-test results between groups in the chair stand test and BBS, but no significant differences in the other assessment results. However, there was improvement in the 2-minute step, arm curl repetitions, and 8-foot up-and-go time in the online training group. While there were not significant improvements in all physical functional assessments, there was improvement in 5 of the 7 assessments. This shows that online training can improve functional limitations in the elderly population who are at a risk for falls (Hong et al., 2018).

Conclusion

The health and fitness industry has had to make changes due to the COVID-19 pandemic. One change that emerged is the implementation of online and virtual training by fitness trainers and their clients. Studies have shown online and virtual training to be successful in improving pain, physical function, and muscular fitness. However, many of these are in special populations instead of the general, healthy population. By examining the use of online and virtual fitness training, cost effectiveness, experiences, and goal achievement an improved and more effective training experience can be achieved by fitness professionals.

CHAPTER III

USE AND PERCEPTIONS OF ONLINE & VIRTUAL TRAINING DURING THE COVID-19 PANDEMIC

Introduction

In December of 2019, a strain of coronavirus (COVID-19) was recognized in Wuhan in the Hubei Province of China (Li et al., 2020; World Health Organization [WHO], 2020). On January 30, 2020, the World Health Organization (WHO) declared a public health emergency of international concern, the WHO's highest level of alarm, over the outbreak of COVID-19 (WHO, 2020). Due to the pandemic, stay-at-home orders were enforced causing many gyms and health clubs in the fitness industry to close their doors to clientele. During the COVID-19 pandemic approximately 6,800 health clubs permanently closed for business and, in total, 1.4 million jobs have been lost in the fitness industry in America (International Health, Racquet & Sportsclub Association [IHSRA], 2021). The loss in revenue and clientele has forced the industry to develop and implement new methods to generate income. Online or virtual training sessions, renting out equipment, an/or moving to outdoor facilities to offer classes are some of the revenue generating options used (Bratland-Sanda et al., 2020; Godefroy, 2020; IHSRA, 2021; Kercher et al., 2020; & Meyers et al., 2020).

Online exercise training allows for a person to train at-home in individual or group sessions and can be through live streaming or prerecorded sessions online. Virtual

training is a method of online training, and commonly the terms are used interchangeably. However, the American College of Sports Medicine (ACSM) differentiated the terms. The ACSM defined virtual training as, “the fusion of group exercise with technology offering workouts designed for ease and convenience to suit schedules and needs” (Thompson, 2021, p.15). Both online and virtual exercise can allow individuals to be physically active while social distancing in their homes. There are many streaming services and platforms that have online and virtual training classes such as, YouTube, Instagram, Facebook, or Zoom. By taking an online class, individuals can be in settings where they are most comfortable exercising in, reduce their travel time and cost, and not have to worry about any intimidation or insecurities from other members of a gym or group fitness class (Abbott, 2016). With applications such as the Mindbody application, a fitness professional can host classes with live streaming or post pre-recorded classes (Weddle, 2020). This allows for individuals to partake in a variety of fitness classes from any instructor at a time that is most convenient in their daily schedule.

There is limited research on online and virtual training, with most studies examining clinical populations (Baes et al., 2016; Hansen et al., 2017, Hong et al., 2018; Jansen-Kosternik, 2015; Liu et al., 2013; Tsai et al., 2017; & Wu et al., 2010). These studies have had positive outcomes, showing improvement in muscular fitness and physical function. However, research on healthy gym-going individuals is limited. This causes concern as online and virtual fitness training are growing in popularity and use among individuals. In the ACSM’s Worldwide Survey of Fitness Trends 2020 survey, online training was ranked as the 26th trend of the upcoming year (Thompson, 2020). In

the 2021 survey, online training ranked as the number one trend for the upcoming year, and virtual training made its first appearance on the list at sixth since being separated from online training in 2020 (Thompson, 2021). During the COVID-19 pandemic The Mindbody application has seen a rise in the use of both online and virtual training on their application. Prior to the pandemic there were 17% of users participating in pre-recorded streams of classes and 7% participating in live streams. During the COVID-19 pandemic, the application saw usage increase to 70% participating in pre-recorded classes and 70% using live streaming classes (Weddle, 2020).

With the adaptation to a more technology-based world, the use of online and virtual training could remain useful tools for exercise professionals and their clientele (IHSRA, 2021). Therefore, the purpose of this investigation was to compare the use of online and virtual training prior to and during the COVID-19 pandemic, and perceptions of online and virtual training among the healthy general population. The goals are to illustrate the changes in participation of online and virtual training during the COVID-19 pandemic, participants exercise- and fitness-related spending, and the opinions of its cost-effectiveness.

Methodology

Participants

This study included 110 participants. There were 93 complete responses with 17 excluded due to not meeting inclusion criteria. The participants included 10 males, 76 females, and 7 “prefer not to say”, ages 18-69 (M = 40.5 years, SD = 15.8 years). Participants were recruited through convenience sampling. This study was approved by

the University Institutional Review Board (see Appendix A) and participants provided informed consent prior to completing the online questionnaire.

Procedures

Prospective participants were sent a recruitment email explaining the purpose, importance, estimated time for completion, and a link to the survey on Qualtrics. A second, reminder email was sent to participants 10 days after the initial recruitment email was sent. Participants were asked to complete the 29-question survey consisting of four parts. The survey was designed to assess participant's physical activity history, online and virtual-based physical activity, and perceptions of online and virtual-based training/coaching. The first section of the survey included demographic questions pertaining to the participants. The second section regarded the participants current and previous physical activity levels. The third section of the survey regarded participants involvement in internet-based physical activity classes and training sessions. The fourth section of the survey explored participants exercise- and fitness-based spending and the opinions on the cost-effectiveness of online and virtual exercise training.

Data Analysis

Survey responses were downloaded from Qualtrics and transferred to IBM SPSS Statistics 24 for Windows 10. Demographic data were analyzed for mean, standard deviation, and frequencies. A McNemar's Chi-square test was run for each item to analyze participation in online streaming or prerecorded exercise video sessions in March 2019 – February 2020 to March 2020 – February 2021, the types of sessions participated in between March 2019 – February 2020 to March 2020 – February 2021, and motivational factors to use online and virtual exercise training between March 2019 –

February 2020 to March 2020 – February 2021. A Wilcoxon ranked sum test was run to analyze the frequency of participation in video sessions between March 2019 – February 2020 to March 2020 – February 2021.

Two paired samples t-tests were run to analyze the average amount of dollars spent on online and virtual exercise training between March 2019 – February 2020 to March 2020 – February 2021, and to analyze the perceived cost-effectiveness of online and virtual exercise training between March 2019 – February 2020 to March 2020 – February 2021. Three one-way repeated measures ANOVA were run to compare the percentage of participants exercise sessions using online or virtual training, the maximum dollar amount participants would be willing to spend on online and virtual exercise training, and the average monthly spending on exercise/fitness related items all between March 2019 – February 2020, March 2020 – February 2021, and once there is a post-pandemic state. Descriptive statistics were run to describe the responses on how the cost of a session effects participants decision to take an online or virtual exercise training session. Statistical significance was set at $p < .05$.

Results

Of the 93 responses to the survey, 80% participants categorized themselves as being physically active. Participants averaged 49 ± 21 minutes per physical activity session on 4 ± 2 days per week, with 46% currently paying a membership to a gym, health club, or fitness center.

Participation in Online and Virtual Exercise Training

A series of McNemar's Chi-Square tests were conducted to analyze participation in online and virtual exercise training between March 2019 – February 2020 and March

2020 – February 2021. A statistically significant difference was reported with higher overall participation in online and virtual exercise training during March 2020 – February 2021 (n = 71) compared to March 2019 – February 2020 (n = 29; p < .001). The use of online streaming videos was statistically higher during March 2020 – February 2021 (n = 25) compared to March 2019 – February 2020 (n = 6; p <. 001). The use of online prerecorded videos was statistically significantly different with higher participation during March 2020 – February 2021 (n = 60) compared to March 2019 – February 2020 (n = 27; p < .001; see Table 1). A Wilcoxon Signed-Ranks Test indicated that frequency of participation on a weekly basis during March 2020 – February 2021, was not statistically higher than the frequency of participation during March 2019 – February 2020, Z = -1.10, p = .273.

Motivational Factors for Participation

Using a McNemar's Chi-Square test to compare participants motivational factors from March 2019 – February 2020 and March 2020 – February 2021, statistically significant differences were identified. Participants were more motivated to use online and virtual exercise training because of cost per sessions (p = .004), less travel (p = .008), more flexible schedules (p = .021), classes not available at their local fitness centers (p = .002) and being more comfortable to exercise from their homes (p < .001; see Table 2), during March 2020 – February 2021 compared to March 2019 – February 2020. Additionally, during the first year of the pandemic, 23% of participants stated they were motivated to perform online and virtual exercise training because of their gym or fitness center being closed due to the pandemic, and 28% stated they were motivated due to health concerns of a busy gym and wanting to socially distance themselves.

Table 1

Changes in Participation in Online and Virtual Exercise Training

	March 2019 – February 2020		March 2020 – February 2021			
	Users (*n*)	Nonusers (*n*)	Users (*n*)	Nonusers (*n*)	χ^2	*p*
Participation in online or virtual exercise training	29	55	71	13	35.02	< .001*
Use of online streaming videos	6	87	25	68	-	< .001*
Use of online prerecorded videos	27	66	60	33	26.26	< .001*
Use of offline prerecorded videos	5	88	4	89	-	1.000

Note. * = Reflects differences based upon users during March 2019 – February 2020 and March 2020 – February 2021; No χ^2 values given when exact test was performed using a binomial distribution.

Table 2

Factors Motivating Participants to Use Online and Virtual Exercise Training

	March 2019 – February 2020		March 2020 – February 2021			
	Yes *(n)*	No *(n)*	Yes *(n)*	No *(n)*	χ^2	*p*
Cost of the sessions	10	83	22	71	-	.004*
Less travel	13	80	25	68	-	.008*
Allows a more flexible schedule	23	70	36	57	5.333	.021*
Access to classes not available at my local fitness center	5	88	18	75	-	.002*
Not having to worry about appearance	10	83	15	78	-	.302
More comfortable to exercise from my own home	16	77	35	58	-	< .001*

Note. * = Reflects differences in motivational factors leading to use of online and virtual training and comparing the factors from March 2019 – February 2020 and March 2020 – February 2021; No χ^2 values given when exact test was performed using a binomial distribution.

Exercise- and Fitness-Related Expenses

A paired samples t-test was conducted to compare the average amount (in dollars) spent per online or virtual exercise training session from March 2019 – February 2020 and from March 2020 – February 2021. There was not a significant difference spent between March 2019 – February 2020 (M = \$9.17, SD = \$16.03) and March 2020 – February 2021 (M = \$9.83, SD = \$4.66); $t(11) = -1.88$, $p = .087$. Using a 10-point Likert scale, with 1 being least effective and 10 being most effective, a paired samples t-test was used to compare the perceived cost effectiveness of online and virtual exercise training sessions between March 2019 – February 2020 (M = 5.62, SD = 3.49) and March 2020 – February 2021 (M = 7.45, SD = 2.88). There was a statistically significant difference in responses by participants, with higher scores during March 2020 – February 2021; $t(64) = -4.14$, $p < .001$.

A one-way repeated measures ANOVA was conducted to compare the percentage of exercise sessions participated in online or virtually, between March 2019 – February 2020 (M = 55.9%, SD = 33.1), March 2020 – February 2021 (M = 61.3%, SD = 30.2), and expected percentage once there is a post-pandemic state (M = 47.43%, SD = 36.5). There were no significant differences in percentage of online or virtual participation among the different time periods ($F(2,21) = 1.30$, $p = .294$).

A series of one-way repeated measures ANOVA tests were conducted to compare the maximum amount participants were willing to spend on an online or virtual training class and average monthly spending on exercise/fitness related items between the time periods of March 2019 – February 2020 and March 2020 – February 2021. The expected amount once there is a post-pandemic state was also queried. There was a statistically

significant difference in the maximum amount participants were willing to spend between March 2019 – February 2020 (*M* = $11.97, *SD* = $30.77), March 2020 – February 2021 (*M* =$27.61, *SD* = $71.09), and expected amount once there is a post-pandemic state (*M* = $18.63, *SD* = $68.09; $F(2,60) = 5.08$, $p = .009$). Post hoc comparisons using the Sidak test indicated there was a statistically significant difference with participants willing to spend a greater amount of dollars during March 2020 – February 2021 compared to a post-pandemic state, $p = .011$. There were no statistically significant differences between time periods in average monthly spending on exercise/fitness related items ($F(2,63) = .20$, $p = .824$). In the sample, 55.8% reported the cost of the session affected their decision to take an online or virtual exercise training session a "great deal, "while 9.1% reported a "little," and 5.2% reported "none at all" (see figure 1).

Discussion

The purpose of this study was to illustrate the changes in participation of online and virtual training during the COVID-19 pandemic, investigate the opinions of its effectiveness, and the opinions on the convenience and cost-effectiveness of this type of exercise training. Online and virtual exercise training can provide a means to allow for those seeking to perform physical activity from personal trainers of their choosing while participating from the privacy of their own homes.

Participation in Online and Virtual Exercise Training

Our study showed a statistically significant difference in participation of online and virtual exercise training from the year prior to the pandemic (March 2019 – February 2020) to the first year of the pandemic (March 2020 – February 2021). Based upon responses to this survey participation levels rose from 34.5% to 84.5% during the first

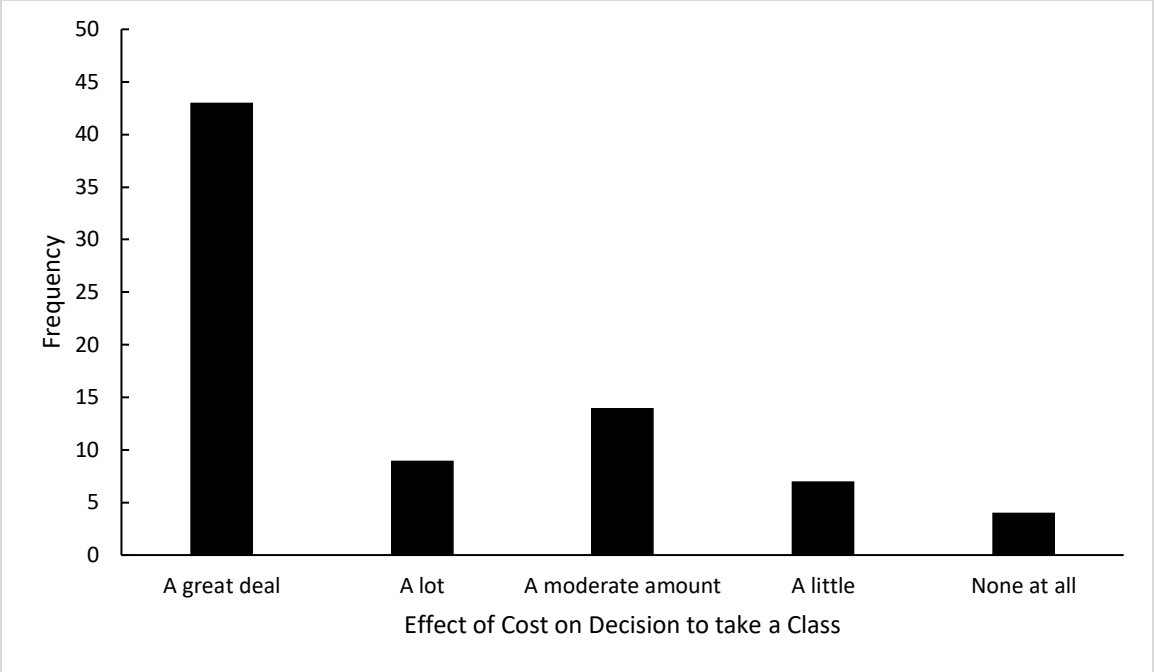

Figure 1. *How cost of an online or virtual training sessions effects decision to take session*

year of the pandemic agreeing with previous research showing that online and virtual exercise training is increasing in use (Bratland-Sanda et al., 2020; Godefroy, 2020; IHRSA, 2021; & Weddel, 2020). The frequency of how often respondents reported participating in online and virtual training in days per week was not significantly different. Nor was the percentage of training sessions completed during March 2019 – February 2020, March 2020 – February 2021, and expected participation once there is a post-pandemic state. However, the use of online streaming and online prerecorded videos saw an increase in participation, going from 6% and 29% the year prior to the pandemic to 27% and 65% in the first year of the pandemic. Weddel (2020) had similar online live stream participation of 7% prior to the pandemic but found an increase in participation to 70% during the pandemic. In the study by Weddel (2020), the participant population came from users of The Mindbody application. This may explain the larger increase in demand as they are already members of the online fitness streaming service. Whereas this current studies population did not all come from members of online or virtual fitness services. Surprisingly, in our study offline prerecorded videos showed decreased use during the first year of the pandemic. Showing the increase in overall use is coming from online sources and not through offline methods.

The present study and Weddel (2020) have shown an increase in online and virtual exercise training participation. However, the expected percentage of participation from respondents once there is a post-pandemic state is less than the first year of the pandemic and the year prior to the pandemic. This could cause some concern for exercise professionals who have made changes in their careers to providing all of their classes and sessions to be through online and virtual exercise training platforms.

Motivational Factors for Participation

During the first year of the pandemic, there was a statistically significant increase in motivational factors to use online or virtual exercise training due to cost of sessions, less travel, allowing of a more flexible schedule, ability to take classes not at their local fitness center, and being more comfortable exercising in their own home. In both the year prior and the first year of the pandemic, the ability to have a flexible schedule and being able to exercise from home had the highest response rates. These could be two marketing points for fitness professionals using online and virtual exercise training as they both appear to be important decision factors for those using online and virtual fitness training.

Exercise- and Fitness-Related Expenses

When analyzing the cost effectiveness of online and virtual training, on average higher scores were recorded during the first year of the pandemic. This also comes with the average cost per session by respondents, though not statistically significantly different, being $0.67 more per session during the first year of the pandemic. Even though the cost per session paid by respondents increased, they believed that the training was more cost effective. The perceived increase in cost effectiveness may potentially come from that fact that gyms, health clubs, and fitness centers across the world were shut down, and thus participants were willing to pay more money to partake in online and virtual sessions. This was shown in our survey as the price participants were willing to pay increased from $11.97 prior to the pandemic to $27.61 during the first year of the pandemic, and the average monthly spending by participants on exercise related items increased from $50.63 the year before to $62.89 during the first year of the pandemic. Though participants seem to be willing to pay more money for the convenience of online

and virtual training during the first year of the pandemic, 55.8% say cost of sessions affect their decision to take classes a great deal while only 14.3% say they consider it a little to none at all.

Conclusion

While online and virtual training saw an increase in participation, the greatest increases arose from online live streaming and online prerecorded videos. Based upon our responses the ability to have a flexible schedule and the ability to exercise from home show the greatest reasons people want to use online and virtual training. These two factors could provide crucial incentives in marketing programs to help promote and increase class participation. Even though respondents were more willing to spend money on online and virtual training during the first year of the pandemic, the cost of classes still plays an important role in the majority of people's decision making when selecting an online or virtual class.

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CHAPTER IV

DETERMINING EFFECTIVENESS OF ONLINE & VIRTUAL TRAINING DURING THE COVID-19 PANDEMIC

Introduction

When the coronavirus-19 (COVID-19) pandemic struck, fitness facilities were forced to close as stay-at-home orders were put into place. Consequently, online and virtual training became more popular for clients to remain physically active (Bratland-Sanda et al., 2020; Godefroy, 2020; International Health, Racquet, & Sportsclub Association [IHSRA], 2021; Kercher et al., 2020; Meyers et al., 2020). According to Google Trends (2021), the search for "online exercise classes" reached a record search rate from April to May 2020, since data began being collected in 2004. The American College of Sports Medicine listed online training and virtual training as the first and sixth highest ranked trends of 2021 (Thompson, 2021). Further highlighting the increased presence of online training and virtual training, the National Academy of Sports Medicine (NASM) has developed a virtual coaching specialization geared toward educating certified personal trainers on how to administer and implement assessments and coaching sessions through an online platform (NASM, 2020).

The unprecedented rise in online and virtual training has exceeded available literature, as currently there is a lack of research on providing exercise training or coaching in an online setting to healthy adults. There is greater knowledge relative to

individuals with musculoskeletal injury or a disease diagnosis (Bennell et al., 2017; Jansen-Kosternik et al., 2015). In patients with chronic lower back pain, 70% showed clinically relevant improvements in pain following virtual training compared to 43% improvements in the traditional rehabilitation group after a 7-week training program (Jansen-Kosternik et al., 2015). However, there was no significant difference in physical function, measured using an Åstrand ergometer bicycle test, between groups following the training period (Jansen-Kosternik et al., 2015). In contrast, Bennell et al. (2017) found a decrease in pain and an increase in physical function after three months of virtual training for individuals with chronic knee pain. Improvements in physical function have also been observed in virtual and online training programs for individuals with chronic obstructive pulmonary disease (Liu et al., 2013; Tsai et al., 2017) and older adults (Baez et al., 2016; Hong et al., 2018; Wu et al., 2010). These improvements were identified using a 6-minute walk distance after participating in a 4-month training program (Liu et al., 2013), and 6-meter walk test and endurance shuttle walk test after 8-weeks of online training (Tsai et al., 2017). In participants older than 65 years of age there have been positive results showing increases in the chair stand test and Timed Up & Go after 8-weeks of virtual training through the Gymcentral Trainee App (Baez et al., 2016), chair stand test and Berg Balance Scale following 12-weeks of online training (Hong et al., 2018), and single leg stance following 15-weeks of online training (Wu et al., 2010).

Collectively, these studies show improvements in pain, physical function, and muscular fitness following online and/or virtual training. However, there is little known regarding the benefits and limitations of online and virtual training in a more physically active, healthy population. Therefore, the purpose of this investigation was to assess the

experience of using online and virtual exercise training classes and determine the efficacy of the exercise training classes taken during the COVID-19 pandemic. The goals were to identify the frequency of participation in online and virtual-based types of exercise training prior to and during the COVID-19 pandemic, types of sessions users participated in, the barriers and changes that prevent the best client experience during online or virtual training, and lastly, how it benefited or hindered their ability to reach their fitness goals.

Methodology

Participants

This study included 110 participants. There were 93 complete responses with 17 excluded due to not meeting inclusion criteria. The participants included 10 males, 76 females and 7 prefer not to say, ages 18-69 (M = 40.5 years, SD = 15.8 years), who have participated in one or more sessions of internet-based exercise. Participants were recruited through convenience sampling. This study was approved by the University Institutional Review Board (see Appendix A) and participants provided informed consent prior to completing the online questionnaire.

Procedures

Prospective participants were sent a recruitment email explaining the purpose, importance, estimated time for completion, and a link to the survey on Qualtrics. A second, reminder email was sent to participants 10 days after the initial recruitment email was sent. Qualified participants were asked to complete the 15-question survey consisting of three parts. The first section of the survey included questions pertaining to the types of classes participating in before and during the COVID-19 pandemic. The second section regarded the goals and ability to achieve goals through online and virtual exercise

training. The third section of the survey regarded participants opinions on the barriers and changes necessary to create a successful client experience using online and virtual exercise training sessions.

Data Analysis

Survey responses were downloaded from Qualtrics and transferred to IBM SPSS Statistics 24 for Windows 10. A McNemar's Chi-square test was run on each type of class respondents participated in between March 2019 – February 2020 to March 2020 – February 2021, and each type of barrier and changes participants would prefer to see in online streaming compared to prerecorded exercise sessions. A Chi-square goodness of fit was run to compare the ease of achieving each goal setting item in online and virtual exercise training to achieving each item during in-person exercise sessions. A 95% confidence interval was used to analyze the mean weight loss of participants who had a goal to lose weight with online or virtual exercise training. Statistical significance was set at $p < .05$.

Results

There were 93 responses to the survey. The participants categorized themselves as being physically active (80%) and averaged 49 ± 21 minutes per physical activity session on 4 ± 2 days per week. Just under half of the sample (46%) currently paid a membership to a gym, health club, or fitness center.

A McNemar's Chi-Square test was used to analyze the types of online and virtual training sessions respondents participated in between March 2019 – February 2020 and March 2020 – February 2021. There was a statistically significant different difference in group fitness classes ($p = .039$), high intensity interval training (H.I.I.T.) ($p < .001$),

dance (p = .016), circuit training (p = .021), and body weight exercise (p = .001 (see Table 1). There was greater participation during March 2020 – February 2021 compared to March 2019 – February 2020 in all five classes.

A McNemar's Chi-Square test was also used to compare the goals participants set when performing online and virtual exercise training to the goals participants achieved while participating in online and virtual training sessions. Participants indicated statistically significantly lower achievement in losing weight (p = .001), tone muscles (p = .039), reduce fat mass (p = .013), improve overall health (p = .039), and improving muscular strength (p = .022) during online and virtual training (see Table 2). Of those that stated they had a goal to lose weight (N = 16), on average, participants lost 14.2 lbs., *95% CI* [7.73, 20.96].

A one-sample Chi-Square test was used to determine whether participants perceived any of the goals were easier to achieve online or virtually compared to exercising in-person at a gym, health club, or fitness center. Of the goals listed, there was a statistically significant difference, with goals being easier to achieve through online or virtual training in lose weight (p = .001), reduce fat mass (p < .001), improve cardiovascular fitness (p = .021), improve overall health (p = < .001), improve flexibility (p = .002), and improve muscular endurance (p = .018). There was a statistically significant difference, with goals being easier to achieve in-person in gain muscle mass (p = .004), improve sports performance (p = <.001), and improve social interaction (p = .001; see Table 3).

Table 1

Modes of Online and Virtual Training Classes Used by Participants

	March 2019 – February 2020		March 2020 – February 2021		
	Users (*n*)	Nonusers (*n*)	Users (*n*)	Nonusers (*n*)	*p*
Personal training sessions	9	84	8	85	1.00
Group fitness classes	10	83	17	76	.039*
H.I.I.T.	14	79	30	63	< .001*
Yoga	26	67	33	60	.189
Dance	6	87	13	80	.016*
Circuit training	5	88	13	80	.021*
Body weight exercise classes	17	76	32	61	.001*
Cycling	5	88	11	82	.070
Bootcamp	1	92	3	90	.500
Boxing/kickboxing	4	89	8	85	.219
Sports performance	2	91	2	91	1.00

Note. H.I.I.T. = High intensity interval training; * = Reflects differences in users of each class during March 2019 – February 2020 compared to March 2020 – February 2021; No χ^2 values are given as tests were performed using a binomial distribution.

Table 2

Goals Participants were Trying to Achieve during Online and Virtual Training

	Goal		Improvement			
	Yes *(n)*	No *(n)*	Yes *(n)*	No *(n)*	*p*	Achievement (%)
Lose weight	36	57	22	71	.001*	61.1
Tone muscles	37	56	29	64	.039*	78.4
Gain muscle mass	11	82	8	85	.549	72.7
Reduce fat mass	22	71	12	81	.013*	54.5
Improve cardiovascular fitness	31	62	32	61	1.000	103.2
Improve overall health	49	44	41	52	.039*	83.7
Improve flexibility	32	61	30	63	.774	93.8
Improve muscular strength	33	60	24	69	.035*	72.7
Improve muscular endurance	17	76	15	78	.754	88.2
Improve sports performance	7	86	5	88	.500	71.4
Increase social interaction	6	87	7	86	1.000	116.7

Note. Goal = Set goals by participants; Improvement = Improvements made by participants in each goal setting option; * = Reflects the number of goals trying to achieve by participants compared to improvements made in each area; No χ^2 values are given as tests were performed using a binomial distribution.

Table 3

Ability to Achieve Goals Based on Online and Virtual Training Compared to In-Person Training

Goals	Easier (*n*)	No Impact (*n*)	Harder (*n*)	*p*
Lose weight	19	36	13	.001*
Tone muscles	25	28	15	.129
Gain muscle mass	12	34	20	.004*
Reduce fat mass	20	36	9	< .001*
Improve cardiovascular fitness	30	25	12	.021*
Improve overall health	36	24	8	< .001*
Improve flexibility	28	31	9	.002*
Improve muscular strength	21	28	17	.244
Improve muscular endurance	22	32	13	.018*
Improve sports performance	11	39	16	< .001*
Increase social interaction	7	30	28	.001*

Note. * = Reflects response rate of made goals easier, no difference, made goals harder compared to an expected equal distribution among response rates.

A McNemar's Chi-Squared test showed no statistical significance on differences in barriers between online streaming and virtual pre-recorded exercise training (see Table 4). There was a statistically significant difference in participants wanting less expensive classes in online streaming compared to prerecorded sessions (p = .004), with a greater amount of participants wanting less expensive classes in online streaming classes (see Table 5).

Discussion

The goals of this study were to characterize differences in online and virtual training prior to and during the COVID-19 pandemic. Specifically, the mode of training used by participants, and settings that created the best client experience during online or virtual training, and how online and virtual training benefited or hindered participant's ability to reach their fitness goals were investigated. This information provides insight to online and virtual exercise training to help develop classes and sessions to improve client satisfaction and improve fitness professionals' businesses.

Online and Virtual Exercise Training Classes

The most common classes respondents participated in the year prior to and during the first year of the pandemic were yoga, bodyweight training classes, and H.I.I.T. sessions. The ACSM's Worldwide Survey of Fitness Trends survey of fitness professionals from around the world is conducted annually to guide programming efforts for the upcoming year. The trends determined by the 2019 survey show yoga as the 7th, bodyweight training as the 5th, and H.I.I.T. as the 3rd most popular classes (Thompson, 2018). In the 2020 ACSM trends, yoga was 14th, bodyweight training was 7th, and

Table 4

Barriers Making it More Difficult to Achieve Goals

	Online Streaming Videos		Prerecorded Videos		
	Yes *(n)*	No *(n)*	Yes *(n)*	No *(n)*	*p*
Time commitment	12	81	12	81	1.000
Lack of equipment	20	73	20	73	1.000
Lack of feedback from coaches/trainers	5	88	9	84	.388
Lack of instruction	5	88	6	87	1.000
Cost of classes	7	86	1	92	.070
Family commitments	12	81	9	84	.453
Personal motivation	26	67	33	60	.167
Space to perform exercises	19	74	20	73	1.000
Other	8	85	4	89	.289
There were no barriers	14	79	14	79	1.000

Note. * = Reflects differences in barriers to online streaming videos to prerecorded videos; No χ^2 values are given as tests were performed using a binomial distribution.

Table 5

Changes Desired in Online Streaming and Prerecorded Classes that Would Increase Respondents' Participation in Classes

	Online Streaming Sessions		Prerecorded Video Sessions		
	Yes *(n)*	No *(n)*	Yes *(n)*	No *(n)*	*p*
Less expensive classes	18	75	6	87	.004*
More instruction from coaches/trainers	5	88	7	86	.727
More feedback from coaches/trainers	7	86	6	86	1.000
Less social interaction	0	93	0	93	
More focused classes based on your needs	10	83	10	83	1.000
Classes that allow more of a variety of intensity ranges	12	81	16	77	.388
Ability to talk and see others participating in the class	8	85	5	88	.508
Less need for specific equipment to participate	17	74	19	74	.791
No changes are needed	19	74	26	67	.167
Other	7	86	5	88	.727

Note. * = Reflects changes participants want in online streaming sessions compared to prerecorded videos; No χ^2 values are given as tests were performed using a binomial distribution.

H.I.I.T. was 2nd most popular (Thompson, 2019). The 2020 trends were released prior to the COVID-19 pandemic, but it is still surprising to see that yoga was the most popular of our respondents and yet came in 14th on the ACSM's trends for 2020 (Thompson, 2019). Of the responses to the types of classes, yoga, body weight training classes, and H.I.I.T. sessions made up 57.6% of all classes participated in during the year prior to the pandemic and 55.9% of classes during the first year of the pandemic. The relative percentages are remarkably similar, and the ranking of the three most popular classes remained the same in each time period. Yoga classes were the most popular in each time period. However, the relative percentage of total sessions actually decreased during March 2020 – February 2021 (26.3%) compared to March 2019 – February 2021 (19.4%). While bodyweight training and H.I.I.T. increased in relative percentage in the first year of the pandemic compared to the year prior. Bodyweight training increased from 17.2% of classes in the year before the pandemic to 18.8% of classes in the first year of the pandemic, and H.I.I.T. increased from 14.1% of classes in the year before the pandemic to 17.6% of classes in the first year of the pandemic. This does not account for the total classes attended, but the sessions users participated at least once. Based upon responses to this survey in both time periods, participants are more interested in partaking in these three modes of training over the other eight (personal training sessions, group fitness classes, dance, circuit training, cycling, bootcamp, boxing/kickboxing, and sports performance) combined.

A combination of yoga, bodyweight training, and H.I.I.T. can provide an adequate method to achieve recommended physical activity levels in all components of health-related fitness. Yoga has been shown to improve not only flexibility but also, muscular

strength and muscular endurance (Cowen & Adams, 2005). Bodyweight training has shown to improve muscular strength, muscular endurance, flexibility, and cardiorespiratory endurance (Lipecki, 2018). Also, H.I.I.T. training has been shown to improve body composition, cardiorespiratory endurance, muscular endurance, and muscular strength (Brown et al., 2018). By promoting a combination of yoga, bodyweight training, and H.I.I.T. fitness professionals can improve all aspects of health-related fitness components in clients.

Goal Setting

In participant's responses to goals they set and improvements made using online and virtual exercise training, improve cardiovascular fitness and improve social interaction had higher responses to improvements than goals set by participants. This shows that more participants improved in these areas than participants with set goals to improve in these areas. The two goals participants were less likely to achieve through online and virtual exercise training were losing weight at 61.1% and reducing fat mass at 54.5%. As many people's lives were drastically changed during the COVID-19 pandemic, the lack of achievement in these areas may potentially come from changes in dietary, in addition to physical activity habits. Cancello et al. (2020) reported 42% of participants in their survey perceived they increased their food intake during lockdown, and 50% reduced their physical activity levels. The area of weight loss and fat reduction could be an area where fitness professionals use supplemental techniques to help improve weight loss in clients who have fallen into poor dietary and physical activity habits during the pandemic. In Shugar et al. (2011), participants who used an armband recording energy expenditure, minutes of moderate and vigorous physical activity, and steps per

day accompanied with a weight loss group, lost more weight than a traditional manual based program, weight loss group programs, and armband alone groups. Educating clients on options available as wearable technology and weight loss groups may be able to provide additional resources and improve goal setting among clients. Additionally, improving overall health was the most important goal to participants.

When analyzing whether it was easier to achieve goals through online or virtual training compared to in-person training, losing weight, reducing fat mass, improving cardiovascular fitness, improving overall health, improving flexibility, and improving muscular endurance were reported easier to achieve through online or virtual training. Improved cardiovascular fitness is expected, as more participants achieved this goal than set out to achieve it. However, lose weight and reduce fat mass had the two lowest achievement rates by participants. This shows, though the achievement rate was relatively low, participants still believed that it was easier to achieve these goals while using online and virtual exercise training.

Exercise professionals should consider the findings from this study to gear and market classes towards client's demands. In this sample, respondents report participating most in yoga, bodyweight training, and H.I.I.T. sessions. With the highest reported goals being improve overall health, tone muscles, and lose weight. By developing classes to meet these criteria fitness professionals using online and virtual fitness training have potential to improve their business and increase clientele.

Barriers and Changes to Online and Virtual Exercise Training

While there were no significant differences in barriers between online streaming and prerecorded videos, the three most common in both scenarios were personal

motivation, space to perform exercises, and a lack of equipment. Professional fitness trainers should take this into consideration when developing classes for online and virtual purposes and design their classes to be able to be performed with little equipment and in smaller spaces. By incorporating these two considerations in mind, there is potential to market these classes to the public and increase their clientele.

When asked about what changes respondents would like to see in online streaming and prerecorded sessions, “no changes are needed” was not selected by 74 respondents for online streaming and 67 respondents for online prerecorded sessions. This is a sign that a majority of respondents are looking for at least one change within online and virtual exercise training sessions. Additionally, aligning with the barriers, the need for less specific equipment was the second most selected response in both online streaming and prerecorded videos. During the COVID-19 pandemic gyms rented out equipment for customers to take home, so they could still workout while under stay-at-home orders (Meyers et al., 2020). This may be a consideration for online and virtual exercise training once there is a post-pandemic state. Gyms that also host supplemental online and virtual training classes could provide these options. Clients could have a potentially less expensive option, with less commitment, to buying expensive equipment and may provide them more opportunities and willingness to participate in classes.

Conclusion

Based upon the results from this study, in the year prior to the pandemic and throughout the first year of the pandemic, the most popular classes were yoga, body weight training, and H.I.I.T. sessions, with weight loss being the primary goal of respondents. It may be important for fitness professionals to invest time and money into

these types of sessions as, based up these findings, they are most in demand. Fitness professionals should also consider developing classes that can be performed in smaller spaced with less equipment. By developing sessions that fit the needs and desires of potential clients and marketing towards these areas, fitness professionals have an opportunity to further develop their business and increase their clientele.

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CHAPTER V

OVERALL CONCLUSIONS

This dissertation included two investigations of online and virtual exercise training. In the first study, changes in participation of online and virtual training during the COVID-19 pandemic, the convenience and effectiveness of this training, and the cost-effectiveness of the training were examined. In the second study, the types of fitness sessions participants used and the aspects of sessions that created the best outcomes and experiences for participants of online and virtual training were investigated.

In study one, participants responded to questions pertaining to participation, money spent on exercise- and fitness-related products, perceived cost effectiveness, and motivational factors for online and virtual training sessions during March 2019 – February 2020 and March 2020 – February 2021. A statistically significant difference was found with higher participation in online and virtual training, the use of online streaming, and use of online pre-recorded videos during March 2020 – February 2021 as compared to March 2019 – February 2020. Participants were also more motivated to perform online and virtual training sessions during March 2020 – February 2021 due to cost of sessions, less travel, more flexible schedules, classes not available at their local fitness centers and being more comfortable exercising from their own homes. Participants believed online and virtual exercise training to be more cost effective during March 2020 - February 2021 as compared to March 2019 – February 2020 and were willing to spend more money on a per month basis during March 2020 -February 2021 as compared to

March 2019 – February 2020. This indicates participants were utilizing online and virtual exercise training more during the first year of the COVID-19 pandemic and were willing to spend more money on online and virtual exercise training as it seemed to be a more cost-effective method during that period.

During the first year of the pandemic, many gyms, health clubs, and fitness centers were forced to close as stay-at-home orders and social distancing measures were in effect. This could explain the observed increased among participants in this study. Based on participant responses, once they are in a post-pandemic state, participants will spend significantly less per class on online and virtual exercise training. In the sample, 55.8% reported the cost of an online or virtual session effects their decision "a great deal." In the future, it will be important for staff and trainers at gyms, health clubs, and fitness centers to consider costs if there is a desire to maintain remote offerings.

In study two, participants responded to questions pertaining to the types of sessions they used, their goal achievement with online and virtual exercise training, the barriers, and changes they would prefer to see in online and virtual exercise training sessions. Participation was greatest in both the year prior to and during the first year of the pandemic in yoga classes, bodyweight training classes, and H.I.I.T. sessions. As participation was highest in both scenarios in these three classes it should be considered, based on our population, that fitness professionals look to develop classes in these three specialties as they have the highest demand. Based upon responses, the goals participants were the least successful at achieving were losing weight and reducing fat mass while the most selected barriers to achieving their goals were personal motivation, lack of equipment, and space to perform exercises. The lack of weight loss and ability to reduce

fat mass may partially be explained by the changes in physical activity and dietary habits during the COVID-19 pandemic, as shown by Cancello et al. (2020). While it may not have met their goals, participants did report they were able to lose weight using online and virtual exercise training, with a self-reported average loss of 14.2 lbs.

With respect to changes respondents would want to see "no changes are needed" was the most selected response. However, it was not selected by a majority of respondents for both online streaming and prerecorded sessions. When comparing changes from online streaming to online pre-recorded classes, only the cost of sessions was significantly different with participants wanting less expensive online streaming classes. The reason why participants wanted changes in cost of online streaming is unknown. However, as shown in study one, our population does take cost of sessions into consideration when selecting which sessions to take. Fitness professionals providing online and virtual training to their clients should consider all changes desired that respondents indicated to improve client satisfaction and efficacy in their practice.

These studies have shown online and virtual exercise training can provide those looking to perform physical activity a method to exercise while exercising from their homes, with less travel, and a more flexible schedule. The combined results can help fitness professionals currently using or looking to start using online or virtual training for their business. It is important for those to consider most respondents consider cost in their decision to take classes and are wanting to spend less on classes once there is a post-pandemic state. The most participated in classes are yoga, body weight, and H.I.I.T. sessions in both time periods, with two of the biggest barriers being a lack of equipment and space to perform exercises. Therefore, when developing classes, exercise

professionals should consider creating classes using yoga, body weight, or H.I.I.T. sessions that require minimal equipment and can be completed in an area that does not require a great deal of space to be able to perform the exercises. By incorporating the results from this research into practice it can help further develop the online and virtual training industry, improve client satisfaction, and help them to achieve their goals.

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APPENDIX

APPENDIX A: IRB LETTER OF APPROVAL

IRB
INSTITUTIONAL REVIEW BOARD
Office of Research Compliance,
010A Sam Ingram Building,
2269 Middle Tennessee Blvd
Murfreesboro, TN 37129
FWA: 00005331/IRB Regn.. 0003571

MIDDLE TENNESSEE STATE UNIVERSITY

IRBN007 – EXEMPTION DETERMINATION NOTICE

Wednesday, May 26, 2021

Protocol Title	***Online and Virtual Training During the COVID-19 Pandemic***
Protocol ID	**21-1182 2q**
Principal Investigator	**Leonard Casterline** (Student)
Faculty Advisor	Jennifer Caputo
Co-Investigators	Samantha Johnson, Sandra Stevens and Dana Fuller
Investigator Email(s)	*ljc3n@mtmail.mtsu.edu; jennifer.caputo@mtsu.edu*
Department/Affiliation	Health and Human Performance

Dear Investigator(s),

The above identified research proposal has been reviewed by the MTSU Institutional Review Board (IRB) through the **EXEMPT** review mechanism under 45 CFR 46.101(b)(2) within the research category ***(2) Educational Tests, surveys, interviews or observations of public behavior*** *(Qualtrics Survey)*. A summary of the IRB action and other particulars of this protocol are shown below:

IRB Action	**EXEMPT from further IRB Review** Exempt from further continuing review but other oversight requirements apply
Date of Expiration	**12/31/2022** *Date of Approval:* **5/17/21** *Recent Amendment:* **5/27/21**
Sample Size	THREE HUNDRED (300)
Participant Pool	**Healthy adults (18 or older) - Individuals who have participated in online or virtual training sessions**
Exceptions	Online consent followed by internet-based survey using Qualtrics is permitted (Qualtrics links on file).
Type of Interaction	☐ Non-interventional or Data Analysis ☒ Virtual/Remote/Online Interview/survey ☐ In person or physical– Mandatory COVID-19 Management (refer next page)
Mandatory Restrictions	**1. All restrictions for exemption apply.** **2. The participants must be 18 years or older.** **3. Mandatory ACTIVE informed consent. Identifiable information including, names, addresses, voice/video data, must not be obtained.** **4. NOT approved for in-person data collection.**
Approved IRB Templates	*IRB Templates:* Recruitment Email and Informed Consent *Non-MTSU Templates:* Verbal Recruitment and Social Media Recruitment
Research Inducement	NONE
Comments	NONE

Summary of the Post-approval Requirements: The PI and FA must read and abide by the post-approval conditions (Refer "*Quick Links*" in the bottom):

- ***Final Report:*** The Faculty Advisor (FA) is responsible for submitting a final report to close-out this protocol before **12/31/2022**; if more time is needed to complete the data collection, the FA must request an extension by email. REMINDERS WILL NOT BE SENT. **Failure to close-out (or request extension) may result in penalties** including cancellation of the data collected using this protocol or withholding student diploma.
- ***Protocol Amendments***: IRB approval must be obtained for all types of amendments, such as:
  - Addition/removal of subject population and sample size.
  - Change in investigators.
  - Changes to the research sites – appropriate permission letter(s) from may be needed.
  - Alternation to funding.
  - Amendments must be clearly described in an addendum request form submitted by the FA.
  - The proposed change must be consistent with the approved protocol and they must comply with exemption requirements.
- ***Reporting Adverse Events:*** Research-related injuries to the participants and other events , such as, deviations & misconduct, must be reported within 48 hours of such events to compliance@mtsu.edu.
- ***Research Participant Compensation:*** Compensation for research participation must be awarded as proposed in Chapter 6 of the Exempt protocol. The documentation of the monetary compensation must Appendix J and MUST NOT include protocol details when reporting to the MTSU Business Office.
- ***COVID-19:*** Regardless whether this study poses a threat to the participants or not, refer to the COVID-19 Management section for important information for the FA.

COVID-19 Management:

The FA must enforce social distancing guidelines and other practices to avoid viral exposure to the participants and other workers when physical contact with the subjects is made during the study.

- The study must be stopped if a participant or an investigator should test positive for COVID-19 within 14 days of the research interaction. This must be reported to the IRB as an "adverse event."
- The FA must enforce the MTSU's "Return-to-work" questionnaire found in Pipeline must be filled and signed by the investigators on the day of the research interaction prior to physical contact.
- PPE must be worn if the participant would be within 6 feet from the each other or with an investigator.
- Physical surfaces that will come in contact with the participants must be sanitized between use
- **FA's Responsibility:** The FA is given the administrative authority to make emergency changes to protect the wellbeing of the participants and student researchers during the COVID-19 pandemic. However, the FA must notify the IRB after such changes have been made. The IRB will audit the changes at a later date and the PI will be instructed to carryout remedial measures if needed.

Post-approval Protocol Amendments:

The current MTSU IRB policies allow the investigators to implement minor and significant amendments that would not result in the cancellation of the protocol's eligibility for exemption. ***Only THREE procedural amendments will be entertained per year*** *(changes like addition/removal of research personnel are not restricted by this rule).*

Date	Amendment(s)	IRB Comments
NONE	NONE.	NONE

Post-approval IRB Actions:

The following actions are done subsequent to the approval of this protocol on request by the PI or on recommendation by the IRB or by both.

Date	IRB Action(s)	IRB Comments
05/26/2021	A social media recruitment script is added.	ADMIN

Mandatory Data Storage Requirement:

All research-related records (signed consent forms, investigator training and etc.) must be retained by the PI or the faculty advisor (if the PI is a student) at the secure location mentioned in the protocol application. The data must be stored for at least three (3) years after the study is closed. Additionally, the Tennessee

State data retention requirement may apply (*refer "Quick Links" below for policy 129*). Subsequently, the data may be destroyed in a manner that maintains confidentiality and anonymity of the research subjects. **The IRB reserves the right to modify/update the approval criteria or change/cancel the terms listed in this notice**. Be advised that IRB also reserves the right to inspect or audit your records if needed.

Sincerely,

Institutional Review Board
Middle Tennessee State University

Quick Links:

- Post-approval Responsibilities: http://www.mtsu.edu/irb/FAQ/PostApprovalResponsibilities.php
- Exemption Procedures: https://mtsu.edu/irb/ExemptPaperWork.php
- MTSU Policy 129: Records retention & Disposal: https://www.mtsu.edu/policies/general/129.php