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PRESS RELEASE

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Immersive Virtual Reality Exergaming during the COVID-19 Pandemic

The UCLA Airway & Exercise Physiology Research Laboratory, established in 1993 to promote the disciplines of pulmonary and exercise physiology in research, is housed in one of the world's premier medical schools and carries out a tripartite mission – research, education, and outreach – to advance the knowledge and practice of exercise physiology to undergraduate, graduate, medical and dental students, as well as postgraduate fellows. The newest laboratory space, *UC Fit*, under the direction of Dr. Brett A. Dolezal, is unique at UCLA in its focus on applied and preventative exercise science, serving as a community hub for translational research and a clinical resource for lifestyle-wellness-fitness interventions that emphasize evidence-based practices.



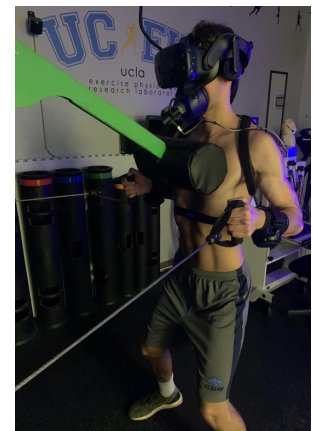
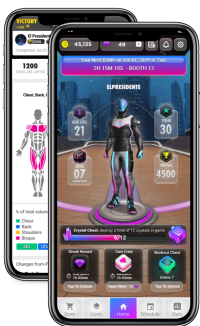
Moreover, living in an era of rampant fitness and wellness misinformation, the lab proudly embraces the role as “guardians” of truth-seekers and truth-tellers in the growing assault on science driven by some mass media and social media platforms.

Spurred by the ongoing COVID-19 pandemic and stay-at-home orders mandating the closure of most public and private gyms nationwide, *UC Fit* has enabled students (and even faculty members) to



exercise independently in the lab using an innovative immersive virtual reality (IVR) workout system. This platform (Black Box VR®; Boise, ID, USA) incorporates video gameplay into cable resistance and high-intensity functional training (HIFT), offering participants a fun and effective way to exercise. During the training sessions, participants perform a series of dynamic cable resistance exercises which are

linked to specific in-game actions and objectives. The system's proprietary machine learning software tracks user performance and utilizes a servo-based electromagnetic-motor-driven mechanism to adjust the cable resistance based on factors such as exhaustion, incomplete repetitions, and remaining sets. Each training session typically includes 18-28 sets of various multi-joint, compound resistance exercises (e.g., chest press, lat pulldown, squat, and deadlifts) and provides adaptable resistance in a safe yet effective manner. Sessions last 30 minute and when performed three to four times a week, provides optimal progressive overload necessary for muscle growth. Participants can also track their performance metrics in real time via a smartphone app which also provides user feedback, training guidance, gameplay tokens, and social media competition. As of February 2021, over 1000 exergame sessions have been completed.



In light of the COVID-19 pandemic and its downstream consequences toward an unprecedented mortality rate, our lab has taken numerous safety precautions to protect the exercise participants and staff. Only one person, donning a N95 mask, has been allowed to work out at a time in the negative-pressure lab



(ideal for aerosol-generating procedures) – prior to entering the lab, a contactless wall mounted infrared forehead thermometer measurement was mandated to screen for fever. During the game, everyone had the option to wear disposable latex gloves and antimicrobial cloth headbands that had been personally assigned to each user. At the end of each session, staff cleaned and sanitized any high-touch surfaces, the VR headset was sanitized using an ultraviolet light box and *Cidex OPA solution*, headgear and facemasks were disinfected after indirect calorimetry via gas exchange measures were utilized to determine energy expenditure for use in an exploratory study (both pictures w/*UC Fit* showcase participants donning this system).

Physical activity is too often overlooked and recently underemphasized and neglected during the ongoing pandemic. A robust immune system is as vital to combating this disease as prevention efforts, such as social distancing and mask wearing. Exercise has been shown to (1) improve immune and inflammation responses to viral infections, (2) reduce physiological and psychological stress, (3) positively impact many of the pre-existing chronic conditions that contribute to approximately 90% of the COVID-19 deaths, and (4) even enhance the effectiveness of the current vaccines. Moreover, acute exercise (such as a 30-min IVR exergaming session) is considered an important immune system adjuvant to stimulate the ongoing exchange of distinct and highly active immune cell types between the circulation and tissues (see great review by Nieman et al, *The compelling link between physical activity and the body's defense system*. *J Sport Health Sci*). Making exercise a daily habit would create a summation effect to further enhance immune defense activity and metabolic health.

Maintaining an active lifestyle, including taking advantage of nascent technologies such as exergaming, during this period of isolation and stress is vital. Gamifying exercise training enhances entertainment and motivation while simultaneously distracting the player from fatigue. Redirected attention towards gameplay has overwhelming implications for especially those that are overtly sedentary. Moreover, our preliminary research results indicate substantial physiological and metabolic demand (*i.e.*, ~85% max HR and >12.9 METs) of these 30-minute IVR exergaming sessions. Considering the myriad of benefits resistance training has in decreasing fat mass while concurrently increasing lean mass, muscle strength and power, energy expenditure, and resting metabolic rate, IVR resistance training has great potential to improve health and fitness. According to the latest *Physical Activity Guidelines for Americans*, adults participating in 150 to 300 minutes of moderate-intensity activity, or 75 to 150 minutes of vigorous-intensity activity per week achieve optimal health benefits. Hence, increasing public participation in exercise is paramount to establishing a healthy population and combating rising levels of obesity. Indeed, IVR exergaming presents a possible link between sedentary pastimes and physical activity that may promote greater public engagement in exercise, especially during this global pandemic.