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Analyzing the Benefits of HIIT for Bariatric Patients During the COVID-19 Pandemic

Delon D. L. Chan[1,*], Hamza H. Ali[1], and Dante A. Filafilo[1]

1 School of Kinesiology, Faculty of Education, University of British Columbia, Vancouver, BC, Canada, V6T1Z4

***Corresponding Author:** delonchan@alumni.ubc.ca*

Abstract

Background: The COVID-19 pandemic has affected millions since December 2019, with certain demographics facing an increased risk. **Purpose:** The purpose of this narrative review was to explore the negative effects of COVID-19 in bariatric patients and analyze the benefits of high intensity interval training for this population during the COVID-19 pandemic. **Methods:** The current literature was searched with relevant keywords through UBC Library, Google Scholar, PubMed, and Medline. **Results**: Bariatric patients have a higher body mass index which is associated with a compromised pulmonary function and immune response, placing them at a greater risk for adverse effects of COVID-19. Patients with obesity experience altered systemic metabolism, influencing glucose and insulin levels and causing an impaired response to immune function. High intensity interval training is effective at controlling glucose levels and insulin output, improving the immune response and potentially reducing the risk for COVID-19. **Conclusion:** High intensity interval training was found to provide various immunopathological, cardiovascular, and psychological benefits for bariatric patients. Future research should analyze this method of exercise as a mediator for severe COVID-19 in obese populations. **Health & Fitness Journal of Canada 2021;14(2):36-41**.
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Keywords: COVID-19, Obesity, high intensity interval training, immunological benefits, psychological benefits, cardiovascular benefits

Introduction

The novel coronavirus, formerly known as 2019-nCoV, was first reported in Wuhan China in late December 2019 and has now become a global pandemic affecting approximately 62.5 million people as of December 2020 (Worldometer, 2020). COVID-19 most commonly presents as acute respiratory distress syndrome (Borczuk et al., 2020). During these unprecedented times, many demographics face different health-related challenges, risk factors, and sociocultural barriers which may prevent them from improving their health (Centers for Disease Control and Prevention, 2020).

The CDC lists overweight and obese populations at an increased risk for severe illness from COVID-19 (Centers for Disease Control and Prevention, 2020). Furthermore, the largest current epidemiological study of hospitalized COVID-19 patients revealed that 77.2% of COVID-19-related hospitalizations were obese or overweight patients (Rizzo et al., 2020). In order to reduce these numbers, the pathological effects of COVID-19 must be understood, in addition to factors that

can improve this population's body mass index (BMI) and health outcomes, such as different modes of exercise (Kemmler et al., 2014; Little et al., 2014).

High intensity interval training (HIIT) is a time-effective mode of exercise that is often recommended to individuals who are identified as overweight or obese (Su et al., 2019). There has been preliminary evidence demonstrating that HIIT could result in greater improvement in cardiorespiratory fitness and a greater reduction in body fat percentage compared to moderate intensity continuous training (MICT) (Türk et al., 2017). Furthermore, there was evidence that demonstrated HIIT was effective in regulating monocyte activation in individuals with obesity, which can strengthen the immune response (de Matos et al., 2019). Therefore, it is hypothesized that HIIT may be able to provide benefits for bariatric patients during the COVID-19 pandemic. More specifically, this body of work aims to summarize and address the negative effects of COVID-19 on obese populations, and analyze the physiological and psychological benefits of high intensity interval training for bariatrics patients, in an attempt to highlight its importance during the COVID-19 pandemic.

Methods

For this narrative review, UBC Library, Google Scholar, and the databases PubMed and Medline were searched for the following keywords: COVID-19, obesity, HIIT, bariatrics. Studies were screened prior to being included in the paper by reading through their titles and/or abstracts. Due to the lack of articles discussing the benefits of HIIT in bariatric patients during the COVID-19 pandemic, a more systematic approach was not taken and instead papers discussing the relationship between COVID-19 and bariatric patients, or the benefits of HIIT in bariatric patients were analyzed in this narrative review.

Results

Implications of COVID-19 for Bariatric Patients

A study done by Borczuk et al., (2020), systematically examined the lungs of 68 autopsies from patients affected by COVID-19. Tracheobronchitis was frequently seen as 94% of the patients demonstrated large airway chronic inflammation (Borczuk et al., 2020). Additionally, 87% of the patients displayed diffuse alveolar damage, 42% displayed large vessel thrombi, and 42% of cases displayed platelet and/or fibrin micro thrombi (Borczuk et al., 2020). These factors contribute to a state of severe acute respiratory distress syndrome (ARDS) (Borczuk et al., 2020). COVID-19 pulmonary pathology becomes more significant as obesity is associated with a compromised pulmonary function (Dietz & Santos-Burgoa, 2020). Patients with increased abdominal obesity present combined with increased diaphragmatic excursion may cause impingement on the lungs when supine (Dietz & Santos-Burgoa, 2020). This can collapse the airways in the lower lobes of the lungs, which is an area where blood arrives to be oxygenated (Dietz & Santos-Burgoa, 2020).

In addition, the novel coronavirus can cause various immunological abnormalities such as T-cell dysregulation and cytokine release syndrome which contribute to the pathogenesis of severe COVID-19 (Kalfaoglu et al., 2020). Individuals with obesity have an impaired immune response to SARS-CoV-2, which could be related to why they are 113% more likely to be hospitalized (Popkin et al., 2020). An increased BMI is associated

with a higher number of anti-inflammatory CD4+ T-cells, and an increased inflammatory cell response may inhibit the body's ability to reduce the infection (Popkin et al., 2020). Obesity is a metabolic disease that can alter systemic metabolism, and influence factors such as insulin resistance or elevated serum glucose (Popkin et al., 2020). The systemic dysregulation can lead to an impaired response to infection, as elevated serum glucose levels can negatively impact the function of immune cells during infection (Popkin et al., 2020). Therefore, individuals with obesity are more likely to be vulnerable to contract COVID-19.

Immunopathological Benefits of HIIT

A meta-analysis done by Su et al., (2019) found that HIIT tended to be superior in reducing fasting blood glucose and insulin resistance compared with MICT. This finding could potentially make HIIT a preferred method of exercise for bariatric patients in reducing COVID-19 severity. Moreover, a study on obese sedentary males revealed that HIIT increases the IFN-γ/IL-4 ratio for about 60 minutes post exercise (de Souza et al., 2018). IFN-γ are cytokines which play a vital role in the adaptive immune response against bacteria and viruses (de Souza et al., 2018). Thus, there is potential for HIIT to help minimize the risk of severe COVID-19 symptoms for bariatric patients by strengthening their immune response (Walsh et al., 2011).

Cardiovascular Benefits of HIIT

HIIT provides a plethora of benefits for bariatric patients. There is preliminary evidence that HIIT with intervals of 2 minutes or longer may be better at improving cardiorespiratory fitness and VO2max compared to MICT, partly due to the reasoning that it can keep the heart and lungs working in a relatively high state (Su et al., 2019). HIIT also increases maximal stroke volume and skeletal muscle mitochondrial respiration, which enhances the O2 utilization rate in peripheral blood, contributing to the improvement in VO2max (Gibala et al., 2012; MacInnis & Gibala, 2017). HIIT is also superior to MICT in improving endothelial function, by increasing the availability of nitric oxide in peripheral vessels (de Oliveira et al., 2020). The improved endothelial function could likely reduce the risk of thrombosis, which was a common complication of COVID-19 (Pearson 1999; Borczuk et al., 2020). Additionally, nitric oxide is responsible for facilitating vascular relaxation, which can assist in reducing blood pressure as well (Jin & Loscalzo, 2010). Grace et al., (2018) reported that HIIT training can improve resting blood pressure, systolic and mean arterial blood pressure, as well as the heart rate reserve without compromising cardiac function in sedentary aging men.

Psychological Benefits of HIIT

Since the COVID-19 pandemic, rates of depression in Canada have increased, which can be attributed in part to people being isolated and disconnected from their communities (Dozios et al., 2021). A study done by Salari et al., (2020) revealed that 96% of individuals admitted to the hospital for COVID-19 experience Post Traumatic Stress Symptoms. This is in comparison to the usual 7% of the general population who experience these symptoms (Salari et al., 2020). Also, it is important to note that the relationship between obesity and depression is bidirectional, meaning the presence of one increases the risk for developing the other (Milaneschi et al., 2019).

A meta-analysis done by Martland et al., (2020) reported effects of HIIT on Quality of Life in participants compared to active controls. Within the study, 25% of participants who engaged in HIIT observed an improvement in Quality of Life compared to active controls. This improvement was seen exclusively within individuals with cardiometabolic disorders. Additionally, anxiety and depression severity were significantly improved following HIIT (Martland et al., 2020). This may be due to the pathophysiology of depression, which is in part determined by brain-derived neurotrophic factors (BDNF) levels (Figueiredo et al., 2019). Clinically, the efficiency of resting BDNF uptake favors neurogenesis and an increased uptake during HIIT may potentiate lipid oxidation and insulin sensitivity (Marosi & Mattson, 2014). Depressive symptoms may also stem from low self-esteem and confidence in self-image (Milaneschi et al., 2019). This low self-esteem can come from poor body-composition, and HIIT has been reported to induce significant improvements in Body Fat/kg and waist circumference (Wewege et al., 2017).

Discussion

The current research offers support that there is potential for HIIT to help minimize the risk of COVID-19 severity for bariatric patients. The evidence suggests that HIIT can improve the immunological, cardiovascular, and psychological function of individuals. However, there are different parameters surrounding HIIT, such as the intensity, length of intervals, rest time between intervals, and the duration of the workouts that can affect its benefits and enjoyment. More research is warranted to investigate the ideal work-to-rest ratio for HIIT to yield a balance of physiological and psychological benefits, as well as maintaining the overall enjoyment of exercising for optimal program adherence. Additionally, more research is still required to fully understand COVID-19 and its implications on the human body, and whether or not HIIT and other forms of exercise can act as an effective tool to reduce the risks of severe COVID-19 in bariatric patients.

Conclusions

The COVID-19 pandemic has had a global impact and resulted in more than a million deaths as of December 2020 (Worldometer, 2020). Bariatric patients are at an increased risk for adverse effects of COVID-19. The immense immunopathological, cardiovascular, and psychological benefits of HIIT demonstrate the potential to aid obese populations during the pandemic. Further research is necessary to investigate the relationship between HIIT and bariatric patients during the COVID-19 pandemic, and the duration of the intervals and rest for HIIT that yield the most benefits for this population.

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Authors' Qualifications

The authors' qualifications are as follows: Delon D. L. Chan, BKin; Hamza H. Ali, BKin; Dante A. Filafilo, BKin

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