

## **A REPORT ON THE IMPACTS OF THE CORONAVIRUS SARS-COV-2 “SHELTER-IN-PLACE ORDER” ON FITNESS AND WELL-BEING**

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(Original scientific paper)

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### **Abstract**

*This study analyzed strong and noticeable shifts affecting fitness and wellbeing of a cohort of college students from Southern California observed during the “shelter-in-place order” triggered by the Coronavirus SARS-CoV-2 (a.k.a. COVID-19) pandemic. The study aimed to test how and to what degree 68 days of stay at home order influenced fitness and wellbeing in an otherwise healthy college student population (n=147). The evident change was reported by 89 (60%) participants, which claimed increased stress levels, while 84% of participants reported dramatic changes in sleeping patterns. Sixty-eight (54%) out of all participating students reported exercising daily before the shelter-in-place was ordered. However, during the lockdown the numbers of those who did not exercise at all, or exercised sometimes increased from 59 to 81. Furthermore, daily intake of refined sugars increased by 38% across the sampled population. Edema was noted by 24% of responders, while 49% acknowledged weight gain, some up to 6.8 kg. Lack of daily exposure to the direct sunlight severely decreased resulting in only 50% of all of the sampled population of students selecting only 0 – 15 min of direct exposure to the sunlight a day. Exceptionally concerning were the overwhelming 59% of participants who stated that they found it harder to do simple tasks during the lockdown. The results of this quantitative study publicized how college students psychosomatically deal with the shelter-in-place order, by revealing some troubling outcomes. The consequences are illustrated by prolonged lack of exercise and direct sunlight, bad dietary choices and changes in sleeping patterns, which when collectively taken into consideration aid decline in fitness and therefore, overall wellbeing. The study preliminarily exposes a possible future, and yet to be fully identified long-term socio-medical negative effects of the pandemic prompted shelter-in-place order.*

**Key Words:** COVID-19, Stress, Sleep, Weight gain, Edema, Wellbeing

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### **Introduction**

The current pandemic and diverse health and safety guidelines are unquestionably changing lifestyles, and therefore affecting well-being and fitness across the globe. This study attempts to identify the change in lifestyles from the perspectives of college students, and present it in a quantitative fashion. The shelter-in-place order prompted by the Coronavirus SARS-CoV-2 pandemic commenced on March 15, 2020, in Southern California in efforts to flatten the curve. At the same time, all traditional face-to-face college courses were ordered to be conducted virtually either via remote or distance learning. This triggered an immediate and forced shift in the lives of college students. Daily changes in sleeping habits, stress, exposure to direct sunlight (Vitamin D), refined or artificial sugar intake, caffeine, weight gain, edema, general ability to complete usually effortless tasks and lack of physical exercise are factors that, when combined, result in a decline in the general wellbeing of most responders, and clearly suggest potentially serious long term ramifications. No research known to the authors, at this time, explored all of the factors associated with the forced prolonged sedentary lifestyle combined and the possible effects it may have on young adults. For instance, it has already been suggested that inconsistencies in subjective and objective sleeping patterns considerably vary based on context and fitness (Akerstedt et al. 2014; Biggins et al. 2019; Minkwitz et al., 2020; Toker & Melamed 2017). Insufficient concentrations of the Vitamin D in the blood have been linked to lack of prolonged exposure of skin to the direct sunlight which among numerous health issues is also linked to disturbances in the sleeping patterns and weight gain (Dahlquist et al., 2015; Heiskanen et al 2020;

Holick, 2011; Nair & Maseeh, 2012; Sergeev, 2020; Sintures, 2020). Processed and or artificial sugar filled diet, exercise and or lack of result in notable metabolic changes in only 3 and ½ days (Jelaca et al., 2016) and that prolonged lack of movement caused edema (Jelaca et al., 2017). As well as that an overall increase in stress has been linked to blending of two very different environments i.e. working from home (Toker & Melamed, 2017; Verhavert et al., 2020). The shelter-in-place resulted in changes that are not yet sufficiently studied combined in a complex pandemic related context. The modifications in daily lives may potentially have serious yet still concealed, but desperately needed to be explored and identified consequences.

### **Method of work**

This short research study was conducted over a period of seven days from May 17 to May 23, 2020, at which time the shelter-in-place order was reinforced for 68 days. A short questionnaire starting with a disclaimer and consisting of seventeen questions in total was distributed and collected digitally, via Google Forms, and included responses from one hundred and forty seven [147] college students. Statistical analysis presented in a form of pie charts by Google Forms was then further analyzed via Google Sheet.

This quantitative research explores how and to what degree the shelter-in-place affected fitness and wellbeing amongst college students from Southern California. The goals of this study are to identify, as much as that is possible at this point in time, evident shifts in daily lives and the influence of these on fitness and overall well-being. In the disclaimer, every single participant was informed that the survey will be anonymous and the only responders who were by the Google Form allowed to continue further were those who agreed that their responses will be used for academic and research purposes. Those who did not accept the disclaimer were automatically disqualified and were unable to proceed with the survey. Google Forms is a software selected for the collection of the responses and the Google Sheet was used for statistical analysis of the final findings. A Google Form was created as a separate survey document, which was then sent out digitally as a link to all of the participants. The data was collected in real time, as the responders finished their survey; the data was automatically recorded into the Google Form.

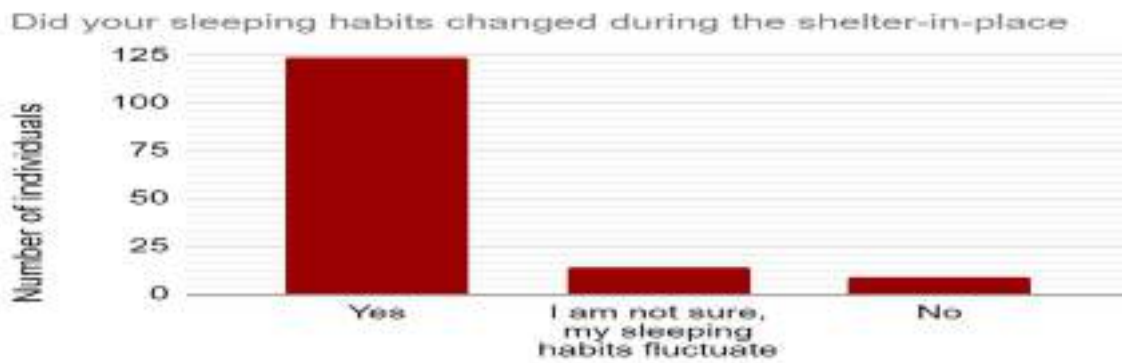
### **Results of the research**

The study is based on the responses of 147 individuals from which 73 or 49.7 percent (%) are males and 74 or 50.3 percent (%) are females. One hundred and twenty seven [86.4 %] responders were born during 1995 or after (which at the time this paper is written will make this largest cohort 25 years old or younger), while 17 [11.6%] are born between, 1985-1994, and finally the smallest number of participants only 4 [2.7%] are born between 1971-1984 (see below, Table 1). Exercise was for the purposes of this study identified as a noticeable increase in heart rate and sweating lasting at least 30 minutes per day and 68 individuals claimed that they exercised and 59 that they did not keep active before the shelter-and-place. At the time of the survey, about two months after the order was issued, 44.9 percent (%) claimed that they are being active, only 19.7 percent (%) claimed no exercise and 35.4 percent (%) stated that they are sometimes exercising 30 minutes a day or longer. In regards to the weight gain, 40 percent (%) reported it, while 15 percent (%) were not sure if they gained any weight; five individuals or 3.4 percent (%) reported weight gain to up to 2.27 kg, 19 percent (%) between 4.5-6.8 kg and 26.5 percent (%) between 0.45-2.26 kg. Bodily water retention was reported by 15.3% or 21 individuals while 12 or 8.8 percent (%) claimed that water retention happens sometimes. Caffeine and energy drinks consumption increased in 20 percent (%) of cases, while refined and artificial sugars intake was reported by 56 individuals or by 38.1 percent (%) while 17.7 percent (%) or 26 of students reported decreased sugar consumption. Sleeping habits changed in 84.4 percent (%) of responders and 9.5 percent (%) reported that they were not sure, as their sleeping habits fluctuated (see below, Graph 1). However, when asked to identify their sleeping patterns 45.6 percent (%) reported sleeping less, 44.9 percent (%) sleeping more than before the shelter-in-place and 9.5% claimed no changes (see below, Graph 2). An alarming 60.5 percent (%) or 89 students claimed that they are more stressed during the shelter-in-place than before and 17 percent (%) or 15 selected maybe as an answer (see below, Graph 3). Only 51 percent (%) of all of the students polled spent at least some time during the day exposed to the direct sunlight, however, only 44.9 percent (%) spent 0-15 min a day, 24 percent (%) 15-30 min, 1 percent (%) 30-45 min and 16.3 percent (%) 45 min or more. However, the SPF fortified products are used by 51 individuals and 2 students are not sure if their daily skin routine is SPF fortified. Working on and completing simple tasks was found harder by 58.5 percent (%) or 86 individuals and additional 15 or 10.2 percent (%) selected maybe as an answer (see below, Graph 4).

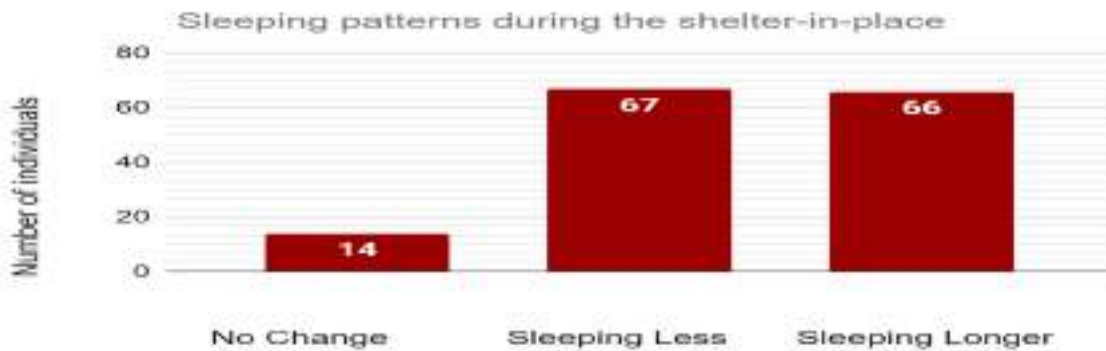
Table 1. Tabular overview on research participant's data

	Males	Females	1971-1984	1985-1994	1995 - After
Number	73	74	4	17	127
Percentage	49.70%	50.30%	2.70%	11.60%	86.40%

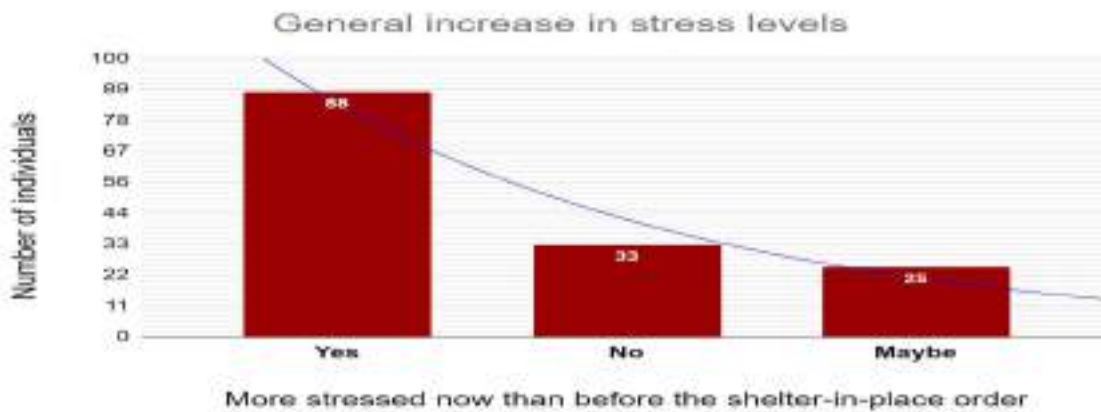
Graph 1. Graphical overview on research participant's data

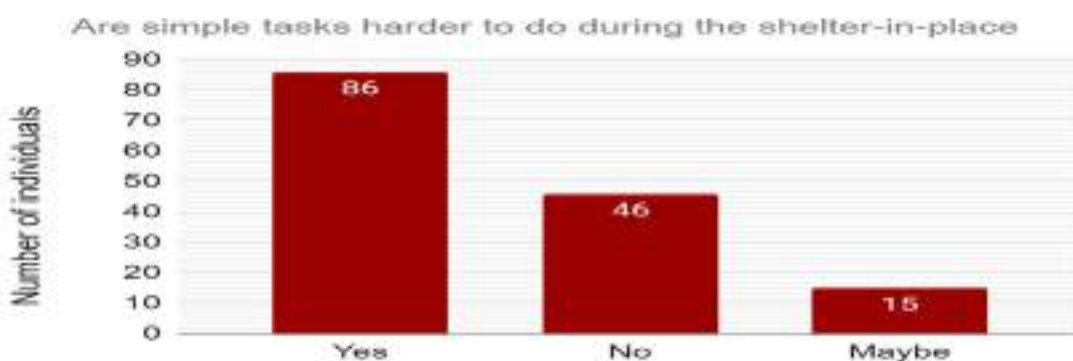


Graph 2. Graphical overview on research participant's data



Graph 3. Graphical overview on research participant's data



**Graph 4.** Graphical overview on research participant's data

## Discussion

The results of this voluntary electronically dispersed survey highlight health hazardous outcomes, which are notably infused by changes in lifestyles due to the SARS-CoV-2 shelter-in-place order, which may result in long-term negative consequences on well-being and fitness. The pandemic and governmental orders associated with it affect individuals in diverse ways, depending on numerous factors including, but not being limited on overall wellness, living arrangements and socio-economic aspects. For example, in addition to stress, isolation, reduction in mobility other factors such as lack of traditional face to face social contact, romantic relationships pattern, anxiety, violence, domestic abuse, lack of control over the virus and thus, loss of one's own daily life choices are all present and are all therefore, creating complex web created by the SARS-CoV-2. Some of these individually specific socio-economic issues such as one's ability to financially provide for basic survival needs such as food, rent, access to medical insurance and or medication, and other various potentially complex aspects that might have different effects on biological sex of the participants have not be looked into, and thus are, the limitations of the study. From 147 responders, 73 are females and 74 males and a great majority or 86.4% are young adults between 18-25 years of age. This is generally a population with high well-being expectations and fitness capabilities.

A significant percentage 77 percent (%) [n=104] of responders reported an increase in stress, which on its own may not be an issue as we were looking at the college population known for its high stress environment induced lifestyle. The factor that influences such high increase in stress within the studied population may be directly linked to lack of boundaries or separation between college/academic and home/domestic environments. These two are blurred into a single environment now. Such arrangements result in an increased risk of fatigue and burnouts as published by Verhavert et al. (2020) and Toker & Melamed (2017). A general ability to complete usually effortless tasks was by 58.5 percent (%) of participants marked as harder, which loudly adds to the above stated.

In addition, this study shows that the high increase in reported stress suggests a very complex web of daily stressors, which are and to a greater degree more present than only stress associated with academically high expectations. To properly elaborate on this below the surface lurking issue all of the variables should be evaluated separately and then combined as a single issue as all of the elements together feed into a singular problematic theme. Sleeping habits remained unchanged during the lock-down in only 9.5 percent (%) [n=14], while astonishing 84.4 percent (%) [n=124] of students reported some irregularities in sleep patterns. Akerstedt and colleagues studied subjective sleepiness and hypothesized that the increase in sleepiness followed by a sedentary long-duration attentional load, which in the case of this study is 45 percent (%) of all responders who spend days working on their computers for a prolonged period of time. The authors also highlighted that a decrease in the sleepiness patterns (in this study 46 percent (%) are associated with the high levels of physical activity (2014).

However, this could also be linked with a 20 percent (%) increase in caffeine intake, reported in this study. The limitations of this study does not allow us to explain details of the physical activity aspects, but it allows for a suggestion that this trend may be due to increased stress and adrenaline associated with academic expectations and performance. Minkwitz and colleagues reported that daytime sleepiness and subjective sleep quality is generally situational, but added that depression affects the subjective and objective sleepiness in non-obese individuals (2020). Biggins et al., explained that even professional

athletes with less disciplined sleeping habits are more likely to experience mood disturbances and general health complaints (2019). Disturbances in sleeping habits are directly linked to numerous aspects of well-being. Sedentary lifestyle just adds to the problem as it results in a complete or a partial lack of a minimal physical activity. Physical activity was for the purposes of this study established as a noticeable increase in a heart rate and sweating lasting at least 30 minutes per day and was not reported by more than a half or a total of 55 percent (%) of young adults polled. A lack of daily exposure to direct sunlight results in insufficient concentration of the Vitamin D in blood, which could be maintained by either a diet rich in Vitamin D, over the counter supplements of Vitamin D, or direct sunlight exposure, the last being the most accessible and free to all. The problem is that hypovitaminosis D is reported to be actively present in about 50 percent (%) of the population globally and it is most commonly associated with the reduced exposure to the sunlight. Even though the exposure to the direct sunlight alone is not enough to maintain the healthy levels of the serum in the blood as it could be as harmful as it is helpful (Nair & Maseeh, 2012). Nevertheless, it definitely could result in elevated chances of decline of already present concentrations of it. Vitamin D is very important in human overall health and plays an irreplaceable role in proper immune responses as well as functions of the metabolic, neurological, cardiovascular systems, etc (Heiskanen, 2020; Holick, 2011; Sergeev, 2020). The daily lives of California college students normally involve exposure to the natural sunlight, however, due to the shelter-in-place order the most natural source of Vitamin D is now accessible for duration lasting only from 1-15 minutes a day to 50% of the responders, while 24 percent (%) and 15 percent (%) were able to access the direct sunlight for 15-30 and 30-45 min. respectively. The remaining 16 percent (%) of the responders reported 45 min or more. Vitamin D is exceptionally important for wellbeing and even among athletes, the healthiest human population; Vitamin D has been linked to highlighted fitness and wellbeing, increased aerobic capacity, muscle growth, force and power production, and a decreased recovery time from exercise (Dahlquist et al., 2015). Even though the majority of the surveyed population did not report spending enough time on the direct sunlight to earn the benefits of it in combination with the diet and supplements, 35 percent (%) reported wearing different varieties of SPF fortified skin products, thus hindering the absorption of the Vitamin.

In addition to sedentary lifestyle, lack of physical activity, notable changes in stress levels, sleeping patterns, an increased consumption of processed and artificial sugar was reported by 38 percent (%) of participants. This is yet another factor that adds to the problem, as a study focusing on a complete lack of processed and artificial sugars in diet reported healthier lower glucose levels in the blood a very short period of time only 3 ½ days (Jelaca et al. 2016). Another troublesome reported variable is edema, seen in 24 percent (%) of individuals and in our study it is suspected to be directly connected to sedentary lifestyle and prolonged sitting, the se percent (%) of the responders. The weight gain percentage observed directly corresponds to the percentage of individuals who do not engage in a minimal daily exercise in this study, but it has been also directly linked by Sintures and colleagues to the disturbances in sleeping patterns (2020) as well as to the low levels of Vitamin D (Sergeev 2020). In addition to unwept sleep hygiene and increased stress level, weight gain may also be linked to combination and accumulation of factors analyzed in this study including: sedentary lifestyle, lack of physical activity, diet high in sodium, increased consumption of caffeinated beverages, food choices high in processed and artificial sugars and metabolic disturbances created by some or all of the factors combined.

The study results suggest that quietly growing hazards to both physical and mental health, as well as to fitness and overall wellbeing are undeniably present. The connection between high stress, sedentary lifestyles, sleep disturbances, lack of exposure to direct sunlight, an increase in consumption of caffeinated beverages, processed and or artificial sugar, edema creation and weight gain clearly exists and will undoubtedly contribute to the decrease overall health and wellbeing over time if the lifestyles conducive to it continue. The fact is however, that the coronavirus SARS-CoV-2 “shelter-in-place order” was mandatory and unavoidable and therefore, altering daily circumstances of all of us and in more ways than one, it affected not only short term adaptations to the sedentary lifestyle, but probably will leave deeper scars on health, and not only to physical, but also to psychological aspects of the wellbeing of humans on a global scale.

## Conclusion

This research was prepared, conducted and presented rapidly during the shelter-in-place order. The study aimed to capture lifestyle changes and responders personal observations during the time of the isolation. The results of the study identified a notable decrease in overall wellbeing and fitness. An increase

in stress, alterations in sleeping habits, lack of exposure to direct sunlight as well as increased sugar and caffeine consumption, edema formation and weight gain are all directly connected to a notable decline in fitness, observable by a lack of physical activity. All of the variables mentioned above jointly result in an overall impoverished sense of well-being. Probable future complications are on the horizon as is the fact that traditional face to face courses are locally not scheduled to commence until December 2020, which could mean that college students will be profoundly affected by continuation of either full or partial isolation thus, further aggravating all of the above discussed changes in lifestyle. The fact is, if each of the variables persists on their own it will be hazardous on the long run, but if all of the factors mentioned in this paper are combined and continue to be persist, the consequences could soon be recognized as a syndrome directly bridged to somatization of the aftermath of the coronavirus SARS-CoV-2 shelter-in-place order. A magnitude and complexity of the shelter-in-place aftermath on human wellbeing and fitness are yet to be reported. Cross-disciplinary scientific research efforts must be engaged in order to confront such complex and mosaic issues before they intensify.

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### Conflict of interest

The authors have no conflicts of interest to report.

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