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Training and Nutritional Habits Before and During COVID-19 Quarantine on Physically Active Women

Original Research

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Abstract

Introduction: COVID-19 pandemic caused a worldwide change in daily habits. Women have reported exercising more during the lockdown and maintaining their healthy habits when obligated to stay home with guidance. **Objective:** This work aimed to determine how the one-on-one personal training guidance affects training volumes and knowledge to maintain healthy habits during the COVID-19 lockdown on physically active young women.

Methods: Twenty-three women participated in the study. Strength and conditioning coaches quantified the training workload before and during the quarantine for each subject. Nutritional intake was obtained through a 24-hour recall and a consumption frequency survey during quarantine.

Results: No significant differences were found between PRE and InQ body weight (56.6 ± 7.0 kg vs. 57.4 ± 7.1 kg), upper body training frequency (3.4 ± 0.8 vs. 3.4 ± 1.0), and lower body training frequency (3.4 ± 0.8 vs. 3.9 ± 1.0). The total calculation of lower-body volume shows a trend of reduction PRE vs. InQ ($p = 0.051$).

Conclusions: COVID-19 negatively affects training volumes on physically active women. However, a one-on-one follow-up by qualified trainers could support training quality and safety.

Key Words: COVID-19, women, training volume

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Introduction

The Coronavirus disease 2019 (COVID-19) pandemic has caused a worldwide change in daily habits to promote social distancing to reduce the fast spread of the virus. Due to these habits, nutrition and physical exercise have been negatively affects by lockdowns[1–4]. It has been described that poor nutrition and lack of exercise modify weight, metabolic control[5], mental well-being, and sleep quality in both men and women[6–8]. Moreover, physical fitness is being proposed cornerstone to attenuate COVID-19 symptoms[9]. This effect depends highly on the person's health status before the infection[10]; for example, people with one or more underlying health conditions (i.e., diabetes, metabolic syndrome, obesity) are more prone to require intensive care when the virus infects them than those with no previous health problems[11]. Moreover, men and women with healthy habits (such as athletes or active individuals) could have a reduced risk for severity upon exposure to the virus[12,13] suggesting that maintaining exercise during a sanitary emergency is vital to overall health[14].

A partial or total decrease in exercise stimulus leads to substantial impairments on different physiological parameters related to a rapid performance loss, such as strength and cardiovascular adaptations[15]. To counteract this, active men and women have adopted home-based training to maintain their physical activity levels and their nutritional patterns[17]. Women significantly reported exercising more during the lockdown but were also more preoccupied with their food intake associated with their appearance than men, suggesting a different impact of the lockdown among genders[17]. Although this home-based scenario could positively promote exercise and energy expenditure during lockdown possesses several limitations, mainly regarding equipment (i.e., weights, dumbbells, treadmills, or stationary bikes), and inexperience in how to execute exercise routines lead to injuries[18]. However, home and supervised training interventions have shown to be a reliable strategy and valuable to improve different health parameters (i.e., glycemia and blood pressure) [19–21]. Although less is known about the physically active gym population, especially females who train in boutique fitness training centers on a daily one-on-one personal training, maintain their training and nutritional habits when obligated to stay home. Therefore, this work aimed to determine how the one-on-one personal training guidance affects training volumes and knowledge to maintain healthy habits during the COVID-19 lockdown on physically active young women.

Scientific Methods

Participants

One week after the Chilean lockdown (March 25, 2020), secondary to the Covid-19 pandemic, females from Motion Training, Health & Rehab Center were contacted to participate in the current study by private corporative message. Inclusion criteria included active members of Motion Center for at least six months and possessing an equipped home gym. Twenty-three women replied and signed the online informed consent following the Helsinki Declaration[22]. Pre-quarantine (Pre) weight was obtained from nutritional records acquired prior to quarantine. The body weight during quarantine was obtained by individual records of participants at home.

Training Volume and Exercise Characteristics

Two strength and conditioning coaches quantified the training workload before and during the quarantine for each subject [23]. The total volume load or tonnage performed by lower and upper extremities was determined by multiplying the number of sets per number of repetitions and the kilograms used in each exercise[24]. The exercise selection consisted of multi and single-joint exercises performed before quarantine as trainers adapted the training schedule considering the limited home equipment during the quarantine period. They supervise all training sessions by videoconference. The chosen exercises included squat variants (i.e., leg press, hack squat, goblet squat, barbell squat, smith squat, front squat), hip hinge variants (conventional deadlift, romanian deadlift, hex bar deadlift, romanian bench, hip thrust, glute bridge), upper push (i.e., vertical and horizontal, flat bench press, incline bench press, shoulder press), upper pulls (i.e., vertical and horizontal): chin-ups, lat-pulldown, rows (both with a barbell, dumbbell, pulleys, or machines) and accessory exercises (i.e., knee extension, knee flexion, shoulder raises, biceps, and triceps exercises).

Calorie, Macronutrient Intake, and Supplement Preference Determination

Nutritional information was obtained through a 24-hour recall and a consumption frequency survey during quarantine. There are no nutritional information records prior to quarantine. Nutritional surveys were performed virtually during the third and fourth week of lockdown to all participants in a 30-minute zoom meeting. A registered sports dietitian (RD) determined the intake of calories, macronutrients, and sports supplements was determined by a registered sports dietitian (RD). Daily caloric and macronutrient estimation was determined by food weight (grams) or portions using the Photographic Atlas of Typical Chilean Food and Preparations by the Institute of Nutrition and Food Technology (INTA), University of Chile[25]. Macronutrient intake was adjusted by kilogram of body weight (kg) to determine intake for the active population[26]. This atlas provides the portion sizes of the most common Chilean foods with their respective macronutrient content.

Statistical Analysis
Descriptive statistics were determined and expressed as mean and standard deviation (Mean ± SD). Paired t-test was used to compare pre and quarantine values. Calories, macronutrients, and the number of meals is expressed in ranges. Data were analyzed using Graphpad Prism 8 for Mac. Significance was set at a $p \leq 0.05$.

Results
A total of 23 women participated in the study (age 36.6 ± 7.8 years). Females had 6.3 ± 5.0 years of experience in resistance training, of which 5.3 ± 4.9 years were under the supervision of a strength and conditioning coach. No significant differences were found between PRE (Pre-Quarantine) and InQ (In-Quarantine) body weight (kg) (56.6 ± 7.0 vs. 57.4 ± 7.1), upper body day training frequency (3.4 ± 0.8 vs. 3.4 ± 1.0), and lower body training day frequency (3.4 ± 0.8 vs. 3.9 ± 1.0) (**Table 1**).

Table 1. Women's training experience and characteristics before and during quarantine. n=23, values are expressed as mean ± SD. InQ - in quarantine.

Variable	(n=23)	p-Value
Age (yrs.)	36.6 ± 7.8	-
Weight (kg)	**PRE** 56,6 ± 7.0 **InQ** 57,4 ± 7.1	0.09
Training Frequency upper body (days)	**PRE** 3.4 ± 0.8 **InQ** 3.4 ± 1.0	0.99
Training Frequency lower body (days)	**PRE** 3.4 ± 0.8 **InQ** 3.9 ± 1.0	0.05
Weight training experience (yrs.)	6.3 ± 5,0	-
Personal training guidance (yrs.)	5.3 ± 4,9	-

Nutritional Variables
The reported caloric intake was ~ 1623 ± 559 kcal /d. regarding the macronutrient intake, women declare to consume ~ 183.4 ± 68.5 g/d of carbohydrates, with a relative value of ~ 3.2 ± 1.2 g/kg. Protein consumption was ~ 111.4 ± 37.2 g/d, with a relative value of ~ 1.9 ± 0.7 g / kg. Regarding fat consumption, the mean intake was~ 49.8 ± 27.5g/ d, with a relative value of 0.8 ± 0.4 g/kg. In relation to the total energy intake (% TEI), women consumed ~ 24.5-62.7% of their calories from carbohydrates (recommended CHO 45-65%), 15.8-47% from protein (recommended PRO 15%), and 10.7-44.5% fat (recommended FAT 20-35%). The water intake was ~ 1,875 ± 550 ml/d. Participants ate on average 4.7 ± 0.9 meals per day. (**Table 2**).

Training Volume
Total calculation of lower-body volume shows a trend to reduction PRE vs. InQ ($p = 0.051$). In contrast, the total volume of the upper body showed a significant decrease in PRE vs. InQ ($p = 0.0001$). No significant differences were found in the number of sets/per week performed in the upper body or lower body, respectively (**Figure 1**).

Supplement Intake Preferences
Of the 13 women who declared to use sports supplements, 62,9% consumed protein powders, 30,8% creatine monohydrate, and ω-3, 38,5% caffeine, while Vitamin-C and Vitamin-D were the only vitamins declared to be consumed by 7,7% of the participants (**Figure 2**).

Table 2. Calorie and nutrient intake during the quarantine**.** Values are expressed as mean ± SD and range, n=23. * TEI- Total Energy Intake, *Data from Institute of Medicine 2005[26]. Rec = Recommended

Nutrient	Mean ± SD	Range	% Total energy intake range	Rec values gr/kg*	N° participants following rec g/kg*	Rec values % TEI**	N° participants following rec % TEI*
Calorie Intake (kcal/d)	1,623 ± 559	711 – 3,198	-	-	-	-	-
Carbohydrate (g/d)	183.4 ± 68.5	43.6 - 371.5	(24.5 - 62.7)	-	-	45 - 65%	12
Carbohydrate (g/kg)	3.2 ± 1.2	0.7 – 6.4	-	5 – 12	1	-	-
Protein intake (g/d)	111.4 ± 37.2	55.5 – 182.4	(15.8 - 47)	-	-	15%	23
Protein intake (g/kg)	1.9 ± 0.7	0.9 – 3.2	-	1.2 – 1.8	8	-	-
Fat intake (g/d)	49.8 ± 27.5	13 – 117	(10.7 - 44.5)	-	-	20 - 35%	12
Fat Intake (g/kg)	0.8 ± 0.4	0.2 - 2	-	-	-	-	-
Water intake (ml/d)	1,875 ± 550	1,165 – 3,000	-	2.2	7	-	-
Number of meals (d)	4.7 ± 0.9	3 - 7	-	-	-	-	-

Figure 1. Upper and lower body training volume before and during quarantine. **A)** upper volume load, **B)** lower volume load, **C)** weekly sets upper body, and **D)** weekly sets upper body. Values are expressed as mean ± SD. Paired t-Test, *p<0.05, **p=0.001, ***p=0.0001.

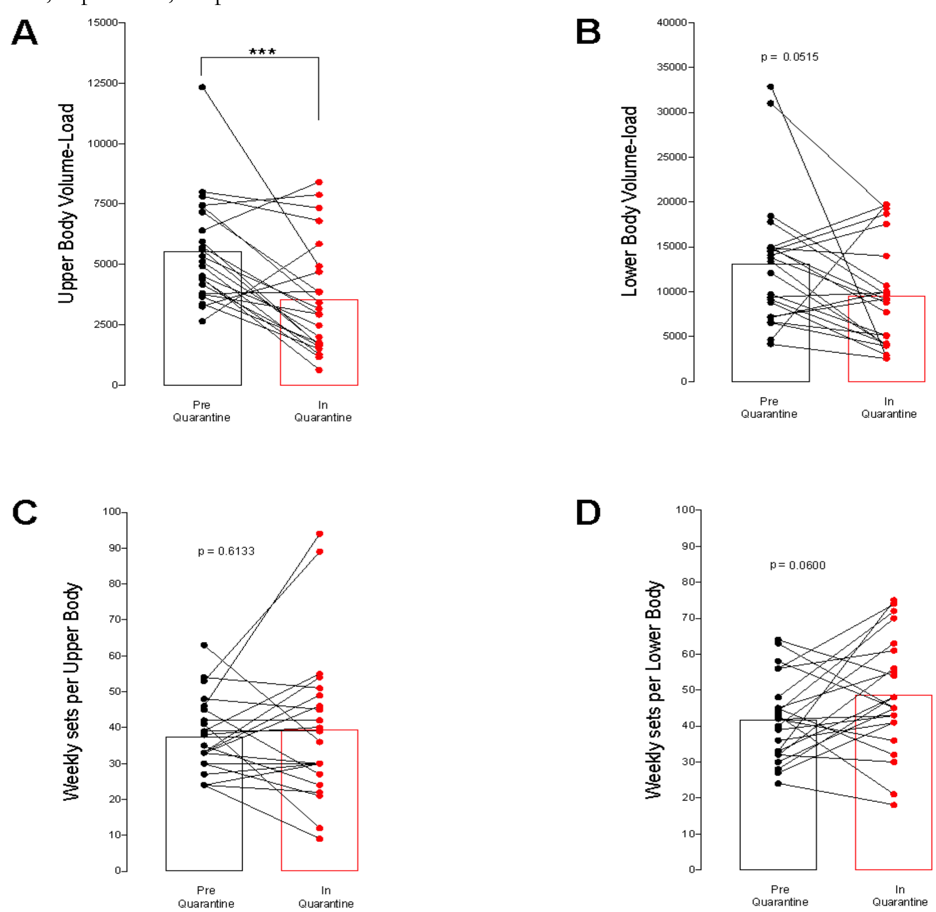
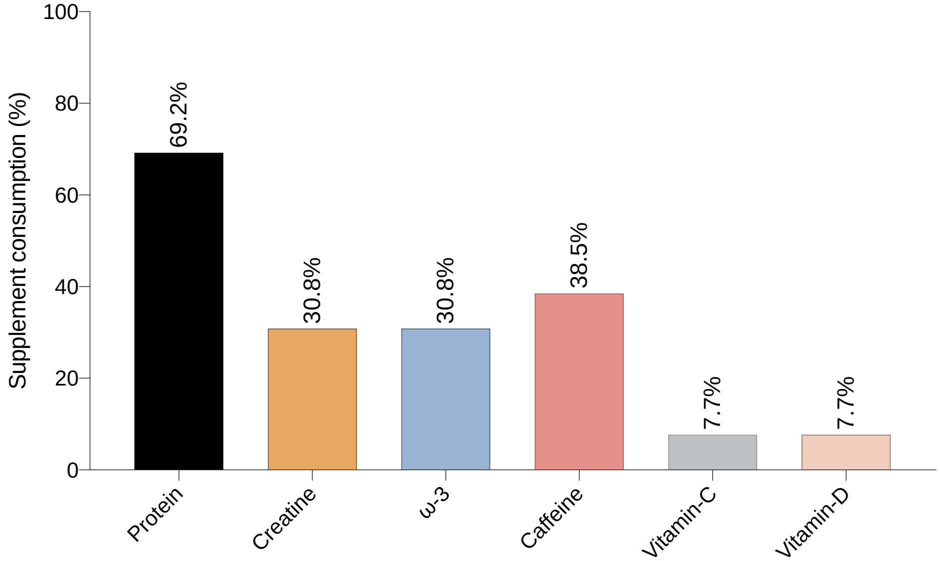


Figure 2. Supplement intake preference during quarantine. Values are expressed as percentages and described as personal preference consumption during the lockdown. n=13.



Discussion

A change in training patterns was adapted due to the lockdown favoring a reduction of volume in the upper (~45%) and lower body (~33%) while modifying the number of repetitions. The reduction in mobility to places such as work, stores, or even training centers by COVID-19 quarantine directly affects overall health [8,27,28]. The decrease in training volume has been shown to alter performance in endurance athletes[29,30] and to be a more relevant parameter than frequency to induce adaptations to strength training[31]. Here, in an explorative approximation, the volume-load of the upper-body was drastically reduced during COVID-19 lockdown while the number of sets showed a trend to increase. Given the relevance of the number of sets in gains in strength and muscle mass, the latter is under current evidence. Recommendations regarding training volume are made considering the number of sets at maximum effort (i.e., muscle failure). According to the latest meta-analysis, the optimal sets vary between 12-20 sets per week when each muscle group is trained twice per week, with no additional benefits from increasing training volume. In this study, the weekly set's volume was calculated as the total performed for the lower and upper body, showing a toward to increase during the lockdown that allowed a greater number of stimulating sets due to the lack of sports implementation[32]. These data possibly indicate that trainers planned a shift towards lighter weights to maintain body composition and muscle performance and avoid injuries. However, the absence of an evaluation of these variables is part of the limitations of the present study.

Guided activities by trained exercise professionals have shown to be helpful to preserve strength and functional adaptations in different health populations[33–35] and athletes[36], suggesting that during situations where extraordinary lockdowns occur, manipulation of training variables needs to be considered and evaluated. Interestingly, the impact of movement restrictions has been described to alter in a greater way on recreational females that engage individual and grouped activities, and especially to impact psychological parameters, this possibly by some works suggesting that females possess higher anxiety and perceived stress than males[37], however, staying active has shown to be positively associated with increased mood and anxiety control during this pandemic[38]. Although we focused on training volumes, we observed an alteration in sleeping patterns determined by a virtual pool (data not shown), advocating that even training at home may not result in the same psychological effects provided classically by exercise on physically active women [39].

The forced disruption in work and social life alters physical exercise, food consumption, and nutritional habits[40]. One month after the COVID-19 lockdown, a significant increase in weight gain was observed in adults with obesity, and this weight change was associated with an increase in consumption of snacks, sweets, and anxiety[27]. These results align with the present work, where we observe a mild (0.8kg, p=0.09) increase in body weight after one month of lockdown on physically active women. Even with continuous and guided training programs, the energy intake was probably altered at the beginning of lockdown. Regarding this, nutritional intake was assessed by an RD using virtual 24-h recalls. Here, a wide variation among participants went from 711 to 3,198kcal/day, with a mean of 1,623kcal/day was observed on daily calorie intake. Interestingly, carbohydrate and fat TEI recommendations were only observed in 12 of 23 participants, while all women followed protein intake recommendations. When this intake was adjusted by body weight and based on TEI values[26], carbohydrate was the primary macronutrient consumed in a lesser quantity as suggested for active people, where the range where from 0.7-6.4 values below the recommended >8g/kg for glycogen load what could eventually alter resistance and endurance exercise [41], but even with this nutritional pattern, our results suggest a well-educated group regarding not only macronutrient intake but also supplement intake preferences. Concerning nutritional supplements intake, all women consumed trusted group A supplements regarding the Australian Institute of Sport [42], where protein was the leading supplement used, followed by creatine, ω-3, and caffeine. Supplement use by fitness enthusiasts has been variable among different countries, and more is prevalent in men than women [43,44]. In Chile, in a survey of initially 1,555 participants, only 28,6% consume any type of supplement, and of that, protein is the most consumed, followed by vitamins and fat burners [45]. In the present study, 20% of the women declare to consume sports supplements whereas 14,3% consume protein, mainly by the knowledge of protein effect on body composition and satiety[46] and where in particular during reduction of physical activity levels could be an effective strategy along with creatine to preserve lean body mass and bone health[47]. Also, the women declared consuming only Vitamin-C and D daily. Vitamin-C has been shown to positively impact markers of inflammation (IL-6) and oxidative stress in healthy participants undergoing acute exercise [48] and increase collagen synthesis only in males[49]. At the same time, in middle-aged and older women, low levels of Vitamin-C are related to lower muscle mass[50] suggesting a positive effect on their intake. On the other hand, Vitamin-D is known to be altered by the absence of sunlight and, in those cases, needs to be supplemented[51]. Vitamin-D deficiency has been associated with COVID-19 severity [52,53], and muscle function and performance in athletes[54]. Here, only a small (7,7%) consumption of Vitamin-D is declared in the present sample of physically active women during the lockdown. At the same time, raise the concert to focus on the intake of these vitamins during a lockdown, especially during the winter season. In the current study, we did not evaluate Vitamin-D status. However, current evidence indicates that the current lockdowns affect Vitamin-D levels worldwide and is a main factor for COVID-19 [55], but the effect of particular consequences on active women is less known.

Conclusions

COVID-19 reduces training volumes on physically active women. However, a one-on-one follow-up by qualified trainers could support training quality and safety. Although nutritional education before COVID-19 lockdown was essential to promote healthy habits observed in the current sample of women, macronutrient and micronutrient intake need to be assessed more closely by RD, mainly because of the considerable variation on carbohydrate intake and the potential effect of different Vitamin-Deficiencies on women who will continue to engage in a high training frequency program at home. Further work is warranted on the direct effects on psychological effects of more prolonged interventions, which could be beneficial in these circumstances, such as the 2020 COVID-19 lockdown.

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