




# THE IMPACT OF COVID-19 ON HEALTHY HABITS AND PSYCHOLOGICAL WELL-BEING OF CHILEAN FEMALE HANDBALL PLAYERS

*El impacto de COVID-19 en los hábitos saludables y el bienestar psicológico de jugadoras de balonmano chilenas*

*O impacto da COVID-19 nos hábitos saudáveis e no bem-estar psicológico das jogadoras de andebol chilenas*

David Suárez-Iglesias<sup>1\*</sup> , Diego Soto<sup>2</sup> , Carlos Ayán Pérez<sup>3</sup> , Óscar Martínez-de-Queil<sup>4</sup> 

<sup>1</sup> VALFIS Research Group, Institute of Biomedicine (IBIOMED), Faculty of Physical Activity and Sports Sciences, University of León, León, Spain; <sup>2</sup> AMRED Research Group, Department of Physical Education and Sport, University of León, León, Spain; <sup>3</sup> Departamento de Didácticas Especiais, Universidade de Vigo, Well-Move Research Group, Galicia Sur Health Research Institute (IIS Galicia Sur), SERGAS-UVIGO, Pontevedra, Spain; <sup>4</sup> Faculty of Education, Department of teaching Languages, Arts and Physical Education, University Complutense of Madrid, Madrid, Spain

\* Correspondence: dsuai@unileon.es

DOI: <https://doi.org/10.17398/1885-7019.19.1>

Recibido: 03/02/2022; Aceptado: 20/06/2022; Publicado: 20/01/2023

## OPEN ACCESS

Sección / Section:  
Balonmano / Handbal

Editor de Sección / Edited by:  
Antonio Antúnez  
Universidad de Extremadura,  
España

Citación / Citation:  
Suárez-Iglesias, D., Soto, D., Ayán, C., Martínez-de-Queil, O. (2023). The impact of covid-19 on healthy habits and psychological well-being of chilean female handball players. E-balonmano Com, 19(1), 1-12.

Fuentes de Financiación / Funding:  
No funding reported by authors

Agradecimientos/  
Acknowledgments:  
The authors would like to acknowledge the contribution of Prof. Dr. Marcos López-Flores in the design of the online questionnaires. We would like to thank the players of the Chile women's national handball teams for their participation in the study.

Conflicto de intereses / Conflicts of Interest:

At the moment of the study, one researcher (DS) was hired by the Chilean Olympic Committee (COCH) as Technical Director of the Chilean Handball Federation, which is affiliated to the COCH

## Abstract

This study aimed to assess the impact of the COVID-19 lockdown on healthy habits in a sample made up of Chilean international elite female handball players. Participants filled in an online survey regarding their physical activity levels, eating attitudes, sleep quality and psychological well-being, twice. The survey was sent within four weeks after mobility restrictions were imposed in Chile, and 16 weeks later, just after the easing of those restrictions began. A total of 18 female handball players who were competing in senior, junior or juvenile categories were analyzed. The obtained data indicated that physical activity levels decreased significantly, as well as psychological well-being. No significant changes were observed in the eating attitudes and sleep quality, although a significant reduction of sleep problems was detected. Sociodemographic and sport-related characteristics did not seem to produce a differential effect on the variables assessed.

**Keywords:** coronavirus; physical activity; eating attitudes; sleep quality; mental health.

## Resumen

Este estudio tuvo como objetivo evaluar el impacto de la cuarentena por COVID-19 sobre los hábitos saludables en una muestra formada por jugadoras de balonmano de élite internacional chilenas. Las participantes rellenaron dos veces una encuesta online sobre sus niveles de actividad física, actitudes alimentarias, calidad del sueño y bienestar psicológico. La encuesta se envió cuatro semanas después de que se impusieran las restricciones a la movilidad en Chile, y 16 semanas más tarde, justo después de que comenzara la relajación de dichas restricciones. Se analizó a un total de 18 jugadoras de balonmano que competían en categorías senior, junior o juvenil. Los datos obtenidos indicaron que los niveles de actividad física disminuyeron significativamente, así como el bienestar psicológico. No se observaron cambios significativos en las actitudes alimentarias ni en la calidad del sueño, aunque se detectó una reducción significativa de los problemas de sueño. Las características sociodemográficas y deportivas no parecieron producir un efecto diferencial sobre las variables evaluadas.

**Palabras clave:** coronavirus; actividad física; actitudes alimentarias; calidad del sueño; salud mental.

## Resumo

Este estudo visava avaliar o impacto do bloqueio COVID-19 em hábitos saudáveis numa amostra composta por jogadoras de andebol femininas de elite internacional chilenas. Os participantes preencheram duas vezes um inquérito online sobre os seus níveis de atividade física, atitudes alimentares, qualidade do sono e bem-estar psicológico. O inquérito foi enviado no prazo de quatro semanas após terem sido impostas restrições de mobilidade no Chile, e 16

semanas mais tarde, logo após ter começado a atenuação dessas restrições. Foi analisado um total de 18 jogadoras de andebol que competiam nas categorias sénior, júnior ou juvenil. Os dados obtidos indicaram que os níveis de actividade física diminuíram significativamente, bem como o bem-estar psicológico. Não foram observadas alterações significativas nas atitudes alimentares e na qualidade do sono, embora tenha sido detectada uma redução significativa dos problemas de sono. As características sociodemográficas e relacionadas com o desporto não pareciam produzir um efeito diferencial nas variáveis avaliadas.

**Palabras clave:** coronavirus; actividade física; atitudes alimentares; qualidade do sono; saúde mental.

## Introduction

The COVID-19 pandemic has prompted governments worldwide to respond by applying various containment measures (World Health Organization, 2020). In the case of Chile, the national disaster led to the declaration of a constitutional state of emergency. A public health action plan was implemented with progressive national and local measures limiting freedom of movement and association (Gobierno de Chile, 2020). Thus, closures of schools and shopping centers, isolation or quarantine (with a night curfew) and social distancing have altered the population's lifestyle. For example, sedentarism and bad eating habits were linked negatively with health-related quality of life in Chile (Gutiérrez-Pérez et al., 2021). Another study in Chilean adults (528 women and 172 men) found that PA patterns (i.e. type, time, duration) and dietary habits may be protective factors for weight increase during COVID-19 confinement (Reyes-Olavarría et al., 2020). Besides, obtaining adequate sleep is another element of interest, and there are recommendations to improve individual's quality of life during this health emergency (Avendaño et al., 2020).

In this context, athletes also had to deal with physical and mental disruptions due to the pandemic and the restrictions and regulations on sporting events (Haan et al., 2021). For instance, decreased training frequency and sleep-related changes have been independently associated with poorer mental health outcomes among elite and sub-elite athletes across multiple sports (Facer-Childs, Hoffman, Tran, Drummond y Rajaratnam, 2021). Likewise, a reduction in physical fitness, training volume, sleep quality, and psychological health was experienced by professional athletes (Jurecka, Skucińska y Gądek, 2021). Under these circumstances, competitive athletes who engaged in a resilience response (i.e. the ability to cope with ongoing stress factors and keep psychological distress to a minimum) (Chen y Bonanno, 2020), were reported to maintain their well-being throughout these adverse times better (Gupta y McCarthy, 2021; Martínez-González, Atienza, Tomás, Duda y Balaguer, 2021).

In addition to resilience, other factors to consider are gender, sports category, age, level of competition and years of sports experience (Lacárcel, Tuttle y Reche, 2022; López-Gajardo, Poce-Bordón, Díaz-García y González-Pulido, 2020). Despite having a better social, economic, cultural, and health environment than neighboring countries, a high percentage of psychological distress was found in Chile (Ruiz-Frutos et al., 2021). In particular, Chilean females were more vulnerable to psychological distress and deteriorated mental well-being compared to males over the pandemic (Duarte y Jiménez-Molina, 2022; Landa-Blanco et al., 2021; Ruiz-Frutos et al., 2021). Also, being a Chilean female was negatively associated with health-related quality of life in Chile (Gutiérrez-Pérez et al., 2021).

Given the greater difficulties that elite and young female athletes faced during the COVID-19 outbreak (Bowes, Lomax y Piasecki, 2020; Bruinvels et al., 2021; Pons et al., 2020), adequate understanding is required of what has happened to them in this country. As far as we know, the effect of this crisis on healthy habits and psychological well-being during the quarantine of the female Chilean sports population has been scarcely explored. An exploratory, cross-sectional, descriptive study conducted on 32 Chile women's national soccer team players revealed that the level of well-being (except for sleep quality) among the participants was negatively affected by the compulsory lockdown. However, the perception of the training load remained the same (Villaseca-Vicuña et al., 2021). The fact that they used a wellness

questionnaire to assess participants' sleep quality and did not investigate eating habits makes the existing scientific evidence somehow incomplete. On top of that, it would be advisable to observe what happened in other sporting groups to facilitate awareness-raising, process optimization, and delivery of consistent training and psychosocial aid that maintain athletes' health and well-being (Haan et al., 2021).

In light of all this, the objective of this study is to assess the impact that the period of restrictive measures due to the COVID-19 pandemic had on PA levels, eating attitudes and sleep quality in a sample of Chilean international elite female handball players.

## Methods

### **Design**

We conducted a pre and post lockdown longitudinal observational study according to the STROBE guidelines for cohort studies (von Elm et al., 2008).

### **Participants**

We selected a sample of 38 elite female handball players who had represented Chile in international matches and were currently part of the selection process for national teams in their different categories. Respondents were not rewarded for participating in the research. Written informed consent was obtained from all participants or their legal guardian. The study was conducted in accordance with the Declaration of Helsinki and was approved by the ethical committee of the University of León (ETICA-ULE-032-2020).

### **Procedures**

Participants completed an online survey created through the Google Forms web survey platform. A personal invitation email (with the link to the survey) was sent by a member of the Chilean Olympic Committee, after being contacted by one of the researchers (Technical Director of the Chilean Handball Federation). The survey was hosted on the Google platform for a limited period. The first survey was sent within four weeks after each Chile's region took constitutional measures to restrict movement. Subsequently, right after the easing of those restrictions began, the survey was sent out (16 weeks after the first one).

### **Measures**

Participants completed an online survey created through the Google Forms web survey platform. A personal invitation email (with the link to the survey) was sent by a member of the Chilean Olympic Committee, after being contacted by one of the researchers (Technical Director of the Chilean Handball Federation). The survey was hosted on the Google platform for a limited period. The first survey was sent within four weeks after each Chile's region took constitutional measures to restrict movement. Subsequently, right after the easing of those restrictions began, the survey was sent out (16 weeks after the first one).

**Sociodemographic and sport-related characteristics:** Athletes provided information on age, height, weight, occupation, marital status, as well as place of residence and number of people in the household during the confinement. Sport-related data (i.e. playing position, whether primarily training with the Chile women's national handball team versus with a club, international category) were obtained from the records of the technical staff of the Chile women's national handball team.

**Resilience:** Resilience was measured at baseline as an assessment of how participants moderated the negative effect of stress and adapted to the adverse quarantine situation. The Resilience Scale (RS-25) (Wagnild y Young, 1993) was used in the Spanish adapted version (Ruiz, de la Vega Marcos, Poveda, Rosado y Serpa, 2012). It is a 25-item, Likert format scale (17 items for the 'personal competence' factor and 8 items for the 'self and life acceptance' factor), written in a positive way (i.e. 'When I make plans, I follow through with them') and scored from 1 (strongly disagree) to 7 (strongly

agree), with total scores varying between 25 and 175. The scoring interpretation is as follows: 25–130, low resilience; 131–145, moderate resilience; 146–175, high resilience (De Oliveira, Machado y Aranha, 2017). The Resilience Scale presents acceptable internal consistency reliability (Cronbach's alpha coefficients ranging from 0.72 to 0.94) (Wagnild, 2009).

**Physical activity levels:** The impact of the confinement on the amount of PA usually performed by the players in a usual week before the constitutional state of emergency was determined and contrasted with that of a typical week during the confinement, as evaluated through the Spanish version of the Minnesota Leisure Time PA Questionnaire (MLTPAQ) (Elosua, Marrugat, Molina, Pons y Pujol, 1994). The MLTPAQ compiles 63 activities in eight categories, including walking, conditioning exercise, water activities, winter activities, sports, garden activities, home repair activities, fishing, and hunting. The players were asked to report the duration of the activities performed in the past week. The participants' total energy expenditure was estimated in metabolic equivalents of task performed in minutes per day (MET-min-day-1). For the purpose of this study, a cut-off point of 300 MET-min-day-1 was established to identify two categories of respondents (i.e. those who were either very active or active), in accordance with previous procedures utilized with Spanish women population (Elosua et al., 2000). The MLTPAQ is a valid instrument for measuring PA performed in adult women (Elosua et al., 2000).

**Eating attitudes:** The effect of the confinement on eating attitudes was measured by means of the Spanish version of the Eating Attitude Test-26 (EAT-26) (Rivas, Bersabé, Jiménez y Berrocal, 2010). The test contains 26 items regarding bulimia, dieting and oral control (i.e. 'I am terrified about being overweight'), with a summative score ranging from 0 to 78. A cut-off at 20 was used to discriminate between individuals with high risk of eating disorders and those without high risk (Rivas et al., 2010). The EAT-26 seems to show a high internal consistency (Cronbach coefficient alpha > 0.90) in females aged 12-35 (Rivas et al., 2010).

**Sleep quality:** Changes on sleep quality due to the confinement were detected through the Spanish version of the 19-item Pittsburgh Sleep Quality Index (PSQI) (Royuela Rico y Macías Fernández, 1997). The 19 items (i.e. 'During the past month, how long has it usually taken you to fall asleep each night?') are grouped into seven component scores (i.e. subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, sleep medication use, and daytime dysfunction). Each component score can range from 0 to 3. The composite PSQI score ranges from 0-21, with higher scores showing worse sleep quality. In distinguishing good and poor sleepers, participants with a total PSQI score > 5 were deemed as poor sleepers. The PSQI has exhibited a satisfactory internal consistency (Cronbach coefficient alpha of 0.65 and 0.74) in young people (Marques et al., 2013).

**Psychological well-being:** The Spanish version of the 5-item World Health Organization Well-being Index (WHO-5) (Lucas-Carrasco, 2012) was administered to assess the impact of the confinement in psychological well-being. The WHO-5 is a short self-report questionnaire comprising positively worded items: 1, "I have felt cheerful and in good spirits"; 2, "I have felt calm and relaxed"; 3, "I have felt active and vigorous"; 4, "I woke up feeling fresh and rested"; 5, "My daily life has been filled with things that interest me". Each item evaluates the degree of well-being during the previous two weeks on a six-point Likert scale ranging from 0 (at no time) to 5 (all of the time); the raw scores are transformed to a total score from 0 (worst thinkable well-being) to 100 (best thinkable well-being). A cut-off score of  $\leq 50$  suggests lack of positive well-being (Topp, Ostergaard, Sondergaard y Bech, 2015).

### **Statistical Analysis**

Descriptive statistics were used to explore the sample characteristics: mean and standard deviation, median and interquartile range (IQR), and number and percentage. The Shapiro-Wilk test was utilized to check the normal distribution of the variables. Accordingly, non-parametric tests were applied for the analysis. The Wilcoxon signed-rank test (continuous variables: weight, PA performed in MET-min-day-1, EAT-26 total score, PSQI total score, WHO-5 total score) and the McNemar's test (dichotomous variables: physically active / very active, high risk of eating disorders / without high risk, poor sleepers / good, lack of positive well-being / positive) were employed to explore the impact of

lockdown in the Chilean international elite female handball players. The change due to lockdown (difference from before to during lockdown) in all the dependent variables (weight, PA, eating attitudes, sleep quality, psychological well-being) related to participants' characteristics was explored by means of the Pearson correlation  $r$ -test for the continuous variables (age and resilience), the Spearman  $\rho$  correlation for an ordinal variable (members per household), the Mann-Whitney U test for the binary variables (marital status, primarily train with the Chile women's national handball team) and the one-way Kruskal-Wallis test for the variable with more than 2 groups (playing position and Chile's region of residence). All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS Inc. Version 25.0, Chicago, IL). Significance level was set at  $p < 0.05$  for all the analyses.

## Results

Out of the 38 elite female Chilean handball players who received the survey, 30 participants answered the first questionnaire (~79% response rate), and 24 completed the second one. Answers from these respondents were excluded if they lived outside of Chile during the quarantine. Moreover, only players with valid data in both time windows of the online survey were included for analyses. Consequently, the final sample was composed of 18 respondents. All the selected athletes had participated in international competition and presented more than eight years of handball experience. The majority of the participants were undergraduates or graduates at the time of this study. The study sample was mostly made up of single individuals who were living with other members of the household. They belonged to different regions of the country. Nearly all of the respondents were field players. The majority of participants were primarily training with the Chile women's national handball team. They were competing for three national teams, with particularly juvenile players. Most of them exhibited high to moderate resilience. The detailed characteristics of the players can be seen in Table 1.

**Table 1.** Characteristics of the study sample. Values are shown as mean  $\pm$  SD, median (IQR) or  $n$  (%).

<i>Variable</i>	<i>Players (N = 18)</i>
Age, years	19.9 $\pm$ 2.4
Height, cm	167.0 $\pm$ 5.8
Weight, kg	66.1 $\pm$ 7.5
BMI, kg	23.7 $\pm$ 2.4
Members per household	4 (4-4)
Filing status	
Single, $n$ (%)	14 (77.8%)
In a relationship, $n$ (%)	4 (22.2%)
Region of residence	
Santiago de Chile, $n$ (%)	9 (50.0%)
Valparaiso, $n$ (%)	3 (16.7%)
Other regions, $n$ (%)	6 (31.3%)
Playing position	
Winger, $n$ (%)	7 (38.9%)
Lateral, $n$ (%)	5 (27.8%)
Centre, $n$ (%)	1 (5.6%)
Pivot, $n$ (%)	4 (22.2%)
Goalkeeper, $n$ (%)	1 (5.6%)
Primarily train with the Chile women's national handball team	
Yes, $n$ (%)	11 (61.1%)
No, $n$ (%)	7 (38.9%)
International category	
Juvenile, $n$ (%)	12 (66.7%)
Junior, $n$ (%)	2 (11.1%)
Senior, $n$ (%)	4 (22.2%)
Resilience	
Resilience, total score	139.8 $\pm$ 14.7
Low, $n$ (%)	5 (27.8%)
Moderate, $n$ (%)	6 (33.3%)
High, $n$ (%)	7 (38.9%)

The impact of the lockdown on the participants' healthy habits and psychological well-being are displayed in Table 2. The change in PA levels during quarantine was significant, both in terms of participants' total energy expenditure and PA category. Thus, although at baseline all participants were deemed as very active, during lockdown six of them were classified as active and the rest remained with no change in their PA condition. We found no significant differences in the eating attitudes between the two time periods, as well as in the sleep quality (based on average values of the total score in the PSQI). Nevertheless, we detected a significant reduction of poor sleepers during quarantine according to PSQI cut-off scores. In addition, the lockdown had a significant impact on psychological well-being, as revealed by the negative change in the WHO-5 total score. Hence, the number of players who showed lower well-being (i.e. those who scored  $\leq 50$  on the WHO-5) significantly increased by 22.2% during the second evaluation period.

**Table 2.** Effect of COVID-19 lockdown on elite handball player's weight, physical activity, risk of eating disorders, sleep quality and psychological well-being. Values before and during lockdown are shown as mean  $\pm$  SD or *n* (%).

Variables	Before lockdown ( <i>N</i> = 18)	During lockdown ( <i>N</i> = 18)	<i>p</i> -value
Weight, <i>kg</i>	66.1 $\pm$ 7.5	66.8 $\pm$ 8.1	0.066
Physical activity (MLTPAQ), <i>MET-min-day</i> <sup>1</sup>	1994.6 $\pm$ 1118.6*	929.0 $\pm$ 801.5	<b>0.002</b>
Physically active / very active, <i>n</i> (%)	0 (0%) / 18 (100%)	4 (22.4%) / 14 (77.8%)	0.125
EAT-26, <i>total score</i>	13.9 $\pm$ 10.5	13.6 $\pm$ 8.6	0.983
High risk of eating disorders / without, <i>n</i> (%)	3 (16.7%) / 15 (83.3%)	5 (26.8%) / 13 (72.2%)	0.727
PSQI, <i>total score</i>	7.1 $\pm$ 2.1	6.2 $\pm$ 2.8	0.285
Poor sleepers / good, <i>n</i> (%)	18 (100%) / 0 (0%)	12 (66.7%) / 6 (33.3%)*	<b>0.031</b>
Psychological well-being (WHO-5), <i>total score</i>	66.9 $\pm$ 20.4*	52.2 $\pm$ 19.6	<b>0.016</b>
Lack of positive well-being / positive, <i>n</i> (%)	3 (16.7%) / 15 (83.3%)	7 (38.9%) / 11 (61.1%)	0.219

*Note.* In bold, significant changes where  $p < 0.05$ . \* significant values favouring before lockdown or during lockdown. MLTPAQ, Minnesota Leisure Time Physical Activity Questionnaire; physically active (MLTPAQ  $\leq 300$  MET-min-day<sup>-1</sup>), physically very active (MLTPAQ  $> 300$  MET-min-day<sup>-1</sup>); EAT-26, Eating Attitude Test-26; High risk of eating disorders (EAT-26  $\geq 20$ ), without high risk of eating disorders (EAT-26  $< 20$ ); PSQI, Pittsburgh Sleep Quality Index; Poor sleepers (PSQI  $> 5$ ), good sleepers (PSQI  $\leq 5$ ); WHO-5, 5-item World Health Organization Well-being Index; Lack of positive well-being (WHO-5  $\leq 50$ ); positive well-being (WHO-5  $> 50$ ).

Sociodemographic and sport-related characteristics did not seem to produce a differential effect on the impact of the lockdown on player's weight, PA, eating attitudes, sleep quality and psychological well-being. Pearson correlation *r* test showed the lack of significant relations between resilience and the change on player's weight, PA, eating attitudes, sleep quality and psychological well-being. The same was true for age. Spearman  $\rho$  correlation test revealed a non-significant relation between members per household and any of the changes in the dependent variables. Mann-Whitney U test detected that marital status was not significantly associated with the changes, being the effect of lockdown similar in single players and those with a partner. The same was true for the differences for those who primarily train with the Chile women's national handball team and those who primarily train with their clubs. Furthermore, one-way Kruskal-Wallis test found no significant differences for the effect of lockdown by region of residence nor playing position.

---

## Discussion

This study aimed to identify the impact of the lockdown restrictions imposed by the Chilean government for a period of 16 weeks during the COVID-19 outbreak on a sample of Chilean international elite female handball players. The results shown here can be useful for coaches and fitness instructors in improving the care of female athletes in the short- and long-term (Bruinvels et al., 2021), as they may improve understanding of how the COVID-19 pandemic has affected the healthy habits of this population.

The COVID-19 lockdown has resulted in significant reductions in PA levels (Ammar et al., 2020), as it happened in our work. This decrease in the amount of PA performed could be due to a lowered training load (Jurecka et al., 2021), as is the case in Spanish female handball players (Mon-López, de la Rubia Rianza, Hontoria Galán y Refoyo Roman, 2020), soccer players (Mon-López, García-Aliaga, Ginés Bartolomé y Muriarte Solana, 2020), professional cyclists (Muriel, Courel-Ibáñez, Cerezuola-Espejo y Pallarés, 2020), and Australian and South African athletes from a range of sports (Facer-Childs et al., 2021; Pillay et al., 2020). Nonetheless, it should be noted that in the present research, most of the participants were still classified as physically very active once the easing of the imposed restrictions began. The fact that a majority of our players remained very active during the lockdown restrictions could be explained on the bases that all players were advised to keep up their physical fitness levels, a good practice that has been previously advocated (Jukic et al., 2020). Accordingly, elite handball players should undergo a supervised home training, with sufficient implementation and adequate training content (i.e. running- specific drills), in order to prevent a decline in aerobic capacity during stay-at-home orders (Fikenzer et al., 2020).

When working with young female athletes, it is of paramount relevance to detect the emergence of symptoms of disordered eating (Kirk, Singh y Getz, 2001). In this aspect, we also did not find an increased risk of developing some form of disordered eating behaviour in our sample, opposite to what has been described in the general population (Ammar et al., 2020). To our knowledge, few investigations have reported the nutritional consequences of the COVID-19 lockdown in the elite level sport. In this regard, Pillay et al. (2020) informed that more than half of the survey respondents (elite and semi-elite athletes in South Africa, with a majority of males) exhibited a deterioration in their dietary habits. The reasons for the discrepancy between these results and our study are not clear but may be related to the fact that all handball players were very active before lockdown, and an appreciable number remained very active despite the reduction in PA after lockdown. In this sense, it could be hypothesized that participants reached a sufficient energy expenditure which contributed to modulate appetite and food intake (Scheid y De Souza, 2010). Moreover, for female college athletes, it has been suggested that eating style is influenced by their own body appreciation, which in turn, is affected by the perceived acceptance from others (Oh, Wiseman, Hendrickson, Phillips y Hayden, 2012). Despite COVID-19's disruption to sport, shelter in place measures reduced opportunities for the participant's body appearance to be directly judged (in a negative way) by coaches, trainers, and teammates. This might also explain why the risk of eating disorders did not significantly exacerbate in our sample.

Similarly, according to the obtained data, the overall sleep quality (i.e., PSQI total score) of the group of Chilean international elite female handball players was not significantly affected. However, a significant reduction of poor sleepers during quarantine was detected. Although it has been found that there was a reduction in sleep quality during the COVID-19 pandemic in professional athletes (Jurecka et al., 2021), it seems that this was not our case. A possible explanation for this might be that hours of sleep have increased during the lockdown, as it occurred for elite and sub-elite athletes across multiple sports (Facer-Childs et al., 2021). Nevertheless, Mon-López et al. (2020a) revealed an increment in sleep duration while sleep quality deteriorated in their sample of handball players; a circumstance that was also noted in soccer players (Mon-López et al., 2020b). To explain this finding, we can only speculate with the idea that the absence of factors that strongly affect athletes' sleep quality, such as competition stress/anxiety, muscle soreness or travel (Halson y Juliff, 2017), had a positive impact on the present group of handball players. Furthermore, the lack of early morning training commitments may have contributed to extend their sleep as much as possible (Steenekamp,

---

Zaslona, Gander, Rowlands y Signal, 2020). In this line our sample, made up mostly of undergraduate or graduate students who had no children, could have benefitted from sleep and work schedules more closely aligned to their endogenous day- and night rhythm due to the non-existence of strict onset hours for college and/or training (Altena et al., 2020).

Besides the aforementioned negative effect on PA levels, the COVID-19 lockdown appeared to have a significant negative impact on the psychological well-being (i.e. mean WHO-5 total score) in the participants of this research. These results corroborate those reported in professional athletes (Jurecka et al., 2021) and players from Chile's women's national soccer team (Villaseca-Vicuña et al., 2021). It may be explained by the fact that our sample included young Chilean women (Ruiz-Frutos et al., 2021), who did not have access to facilities to train for their sport (Pons et al., 2020). Impairment in psychological well-being has also been linked to decreased weekly PA during COVID-19 lockdown for the adult population (Chouchou et al., 2021), as it is our case. Comparison of the present finding with that of Pons et al. (2020) confirms the substantial negative effect of confinement on young female athletes' mental health, and match those observed in earlier studies. For instance, di Fronso et al. (2020) collected data on both individual and team Italian competitive athletes. These athletes reported that the pandemic situation had a strong effect that impaired their perceived stress and psycho-social states. Similarly, Pillay et al. (2020) detailed that more than half of the athletes enquired felt depressed due to COVID-19 pandemic measures. Another result worth mentioning is that although most of our participants exhibited moderate to high resilience, a considerable proportion of players lacked psychological well-being during the pandemic. This also accords with the narratives of the loss and incongruence faced by elite athletes engaged in a resilience process during the COVID-19 lockdown experience, with negative emotional reactions to these adversities (Gupta y McCarthy, 2021). This is an interesting finding for coaches and sport psychologists, given that in handball players, mood can influence training and recovery conditions during the quarantine (Mon-López et al., 2020a). Therefore, strategies directed at improving not only PA levels, but also psychological well-being, should be developed for athletes during isolation periods, as it has been recently proposed (Haan et al., 2021; Martínez-González et al., 2021). For example, attending online group-based sessions involving PA may be particularly helpful to ameliorate social support and connectedness with teammates, which are associated with better mental health and well-being among young athletes (Graupensperger, Benson, Kilmer y Evans, 2020).

We have to acknowledge limitations to this study. Since we used voluntary response sampling, the small sample size limited the statistical power of this research. In addition, the follow-up response rate was low. Future work with larger numbers should be conducted to gather more widely generalizable results. We employed subjective measurements to evaluate healthy habits, but the use of accelerometers to objectively monitor PA and sleep-wake patterns would be ideal due to the reduced number of participants. Participants' sport could also have played a role in our results, making it necessary to study the effects of COVID-19 pandemic on individual sport athletes' healthy habits. There are several methodological strong points that must be acknowledged. In first place, this was a longitudinal study, since data was registered before and after the restrictions due to COVID-19 pandemic were imposed. In contraposition, most of the existing investigations conducted with athletes have used a cross-sectional design. Secondly, our sample was entirely made up of international elite female athletes. On this point, it has been recommended that studies should put greater emphasis on the female sports context, often in the process of professionalization, and which seems to be more fragile in the face of the health and socioeconomic crisis (Clarkson, Culvin, Pope y Parry, 2022; di Fronso et al., 2020). Thirdly, we used validated questionnaires that help to diagnose the existence of risky behaviours on a number of healthy habits. Lastly, we provided information regarding the influence of sport-related characteristics, such as category or performance level on the effects of the COVID-19 pandemic lockdown.



## Practical Application

The COVID-19 pandemic lockdown has significantly impacted PA levels and the psychological well-being of a group of Chilean international elite female handball players. Eating attitudes and sleep quality were not affected by the isolation period. These findings could help sports staff to develop strategies to ensure a safe return to competition for their athletes. Namely, the reduction in PA levels may demand that strength and conditioning practitioners design and implement a tailored training program following the isolation period considering the possible physical deconditioning. Likewise, from the point of view of the adverse psychological effects of a period of isolation on the mental health of athletes, sports psychologists should detect this issue and subsequently develop strategies to restore levels of well-being. Due to its relevance for performance, sports scientists, nutritionists, and physicians are encouraged to closely monitor the sleep quality and quantity and the eating attitudes and nutritional status of all individuals during the lockdown and once practice and competitions are restarted. Coaches must be aware of the above performance dimensions and be eager to manage the data and opinions from both sports staff and athletes to optimize the team's functioning during these periods of isolation, therefore guaranteeing a smooth return to participation in sports competition.

**Author Contributions:** Conceptualization, D.S-I., D.S., C.A.P., and O.M-Q.; Data curation, D.S-I., D.S., C.A.P., and O.M-Q.; Formal analysis, D.S-I., C.A.P., and O.M-Q.; Investigation, D.S-I., D.S., C.A.P., and O.M-Q.; Methodology, D.S-I., D.S., C.A.P., and O.M-Q.; Conceptualization, D.S-I., D.S., C.A.P., and O.M-Q.; Writing – original draft, D.S-I., and C.A.P.; Writing – review & editing, D.S-I., D.S., C.A.P., and O.M-Q. All authors have read and accepted the published version of the manuscript.

## Referencias

- Altena, E., Baglioni, C., Espie, C. A., Ellis, J., Gavrilloff, D., Holzinger, B., ... Riemann, D. (2020). Dealing with sleep problems during home confinement due to the COVID-19 outbreak: Practical recommendations from a task force of the European CBT-I Academy. *Journal of Sleep Research*, 29(4), e13052. <https://doi.org/10.1111/jsr.13052>
- Ammar, A., Brach, M., Trabelsi, K., Chtourou, H., Boukhris, O., Masmoudi, L., ... Hoekelmann, A. (2020). Effects of COVID-19 home confinement on eating behaviour and physical activity: results of the ECLB-COVID19 international online survey. *Nutrients*, 12(6), 1583. <https://doi.org/10.3390/nu12061583>
- Avendaño, L., Cerda, S., Giadach, C., Hernández, A., León, P., Menéndez, P., ... Riffo, C. (2020). Recomendaciones para un buen dormir durante cuarentena por COVID-19. *Revista Chilena de Pediatría*, 91(7), 94.
- Bowes, A., Lomax, L., y Piasecki, J. (2020). The impact of the COVID-19 lockdown on elite sportswomen. *Managing Sport and Leisure*, 1–17. <https://doi.org/10.1080/23750472.2020.1825988>
- Bruinvels, G., Lewis, N. A., Blagrove, R. C., Scott, D., Simpson, R. J., Baggish, A. L., ... Pedlar, C. R. (2021). COVID-19-considerations for the female athlete. *Frontiers in Sports and Active Living*, 3. <https://doi.org/10.3389/FSPOR.2021.606799>
- Chen, S., y Bonanno, G. A. (2020). Psychological adjustment during the global outbreak of COVID-19: A resilience perspective. *Psychological Trauma: Theory, Research, Practice, and Policy*, 12(S1), S51–S54. <https://doi.org/10.1037/tra0000685>
- Chouchou, F., Augustini, M., Caderby, T., Caron, N., Turpin, N. A., y Dalleau, G. (2021). The importance of sleep and physical activity on well-being during COVID-19 lockdown: reunion island as a case study. *Sleep Medicine*, 77, 297–301. <https://doi.org/10.1016/j.sleep.2020.09.014>
- Clarkson, B. G., Culvin, A., Pope, S., y Parry, K. D. (2022). Covid-19: Reflections on threat and uncertainty for the future of elite women's football in England. *Managing Sport and Leisure*, 27(1-2), 50–61. <https://doi.org/10.1080/23750472.2020.1766377>
- De Oliveira, A. C. P., Machado, A. P. G., y Aranha, R. N. (2017). Identification of factors associated with resilience in medical students through a cross-sectional census. *BMJ Open*, 7(11), e017189. <https://doi.org/10.1136/bmjopen-2017-017189>
- di Fronso, S., Costa, S., Montesano, C., Di Gruttola, F., Ciofi, E. G., Morgilli, L., ... Bertollo, M. (2020). The effects of COVID-19 pandemic on perceived stress and psychobiosocial states in Italian athletes. *International Journal of Sport and Exercise Psychology*, 1–13. <https://doi.org/10.1080/1612197X.2020.1802612>

- Duarte, F., y Jiménez-Molina, Á. (2022). A longitudinal nationwide study of psychological distress during the COVID-19 pandemic in Chile. *Frontiers in Psychiatry*, 13, 204. <https://doi.org/10.3389/FPSYT.2022.744204/BIBTEX>
- Elosua, R., Garcia, M., Aguilar, A., Molina, L., Covas, M. I., y Marrugat, J. (2000). Validation of the Minnesota leisure time physical activity questionnaire in Spanish women. *Medicine and Science in Sports and Exercise*, 32(8), 1431–1437. <https://doi.org/10.1097/00005768-200008000-00011>
- Elosua, R., Marrugat, J., Molina, L., Pons, S., y Pujol, E. (1994). Validation of the Minnesota Leisure Time Physical Activity Questionnaire in Spanish men. The MARATHOM investigators. *American Journal of Epidemiology*, 139(12), 1197–1209. <https://doi.org/10.1093/oxfordjournals.aje.a116966>
- Facer-Childs, E. R., Hoffman, D., Tran, J. N., Drummond, S. P. A., y Rajaratnam, S. M. W. (2021). Sleep and mental health in athletes during COVID-19 lockdown. *Sleep*, 44(5). <https://doi.org/10.1093/SLEEP/ZSAA261>
- Fikenzer, S., Fikenzer, K., Laufs, U., Falz, R., Pietrek, H., y Hepp, P. (2020). Impact of COVID-19 lockdown on endurance capacity of elite handball players. *The Journal of Sports Medicine and Physical Fitness*. <https://doi.org/10.23736/S0022-4707.20.11501-9>
- Gobierno de Chile. (2020). *Gob.cl - plandeaccion*. <https://www.gob.cl/coronavirus/plandeaccion/>
- Graupensperger, S., Benson, A. J., Kilmer, J. R., y Evans, M. B. (2020). Social (un)distancing: teammate interactions, athletic identity, and mental health of student-athletes during the COVID-19 pandemic. *Journal of Adolescent Health*, 67(5), 662–670. <https://doi.org/10.1016/j.jadohealth.2020.08.001>
- Gupta, S., y McCarthy, P. J. (2021). Sporting resilience during COVID-19: what is the nature of this adversity and how are competitive elite athletes adapting? *Frontiers in Psychology*, 12, 374. <https://doi.org/10.3389/FPSYG.2021.611261/BIBTEX>
- Gutiérrez-Pérez, I. A., Delgado-Floody, P., Jerez-Mayorga, D., Soto-García, D., Caamaño-Navarrete, F., Parra-Rojas, I., ... Guzmán-Guzmán, I. P. (2021). Lifestyle and sociodemographic parameters associated with mental and physical health during COVID-19 confinement in three Ibero-American countries. A cross-sectional pilot study. *International Journal of Environmental Research and Public Health*, 18(10), 5450. <https://doi.org/10.3390/IJERPH18105450>
- Haan, R., Ali Alblooshi, M. E., Syed, D. H., Dougman, K. K., Al Tunaiji, H., Campos, L. A., y Baltatu, O. C. (2021). Health and well-being of athletes during the Coronavirus pandemic: a scoping review. *Frontiers in Public Health*, 9. <https://doi.org/10.3389/FPUBH.2021.641392>
- Halson, S. L., y Juliff, L. E. (2017). Sleep, sport, and the brain. *Progress in Brain Research*, 234, 13–31. <https://doi.org/10.1016/bs.pbr.2017.06.006>
- Jukic, I., Calleja-González, J., Cos, F., Cuzzolin, F., Olmo, J., Terrados, N., ... Alcaraz, P. E. (2020). Strategies and solutions for team sports athletes in isolation due to COVID-19. *Sports*, 8(4), 56. <https://doi.org/10.3390/sports8040056>
- Jurecka, A., Skucińska, P., y Gądek, A. (2021). Impact of the SARS-CoV-2 Coronavirus pandemic on physical activity, mental health and quality of life in professional athletes—a systematic review. *International Journal of Environmental Research and Public Health*, 18(17), 9423. <https://doi.org/10.3390/IJERPH18179423>
- Kirk, G., Singh, K., y Getz, H. (2001). Risk of eating disorders among female college athletes and nonathletes. *Journal of College Counseling*, 4(2), 122–132. <https://doi.org/10.1002/j.2161-1882.2001.tb00192.x>
- Lacárcel, A. I., Tuttle, V., y Reche, C. (2022). Habilidades psicológicas para la fortaleza mental en jugadores de balonmano. *E-balonmano.Com: Revista de Ciencias del Deporte - Journal of Sport Science*, 18(1), 35-44.
- Landa-Blanco, M., Mejía, C. J., Landa-Blanco, A. L., Martínez-Martínez, C. A., Vázquez, D., Vázquez, G., ... Montoya, B. D. (2021). Coronavirus awareness, confinement stress, and mental health: Evidence from Honduras, Chile, Costa Rica, Mexico and Spain. *Social Science y Medicina* (1982), 277. <https://doi.org/10.1016/J.SOCSCIMED.2021.113933>
- López-Gajardo, M.A., Poce-Bordón, J.C., Díaz-García, J., y González-Pulido, J.J. (2020). La importancia de la superación de las adversidades en el aumento del rendimiento grupal en balonmano, baloncesto y fútbol. *E-balonmano.Com: Revista de Ciencias del Deporte - Journal of Sport Science*, 16(3), 203-212.
- Lucas-Carrasco, R. (2012). Reliability and validity of the Spanish version of the World Health Organization-Five Well-Being Index in elderly. *Psychiatry and Clinical Neurosciences*, 66(6), 508–513. <https://doi.org/10.1111/j.1440-1819.2012.02387.x>

- Marques, D., Gomes, A. A., Meivavia, A., Salgueiro, A., Ribeiro, C. C., y Dischler, J. (2013). Reliability and initial validation of the Pittsburgh Sleep Quality Index, European Portuguese version: a preliminary study in a sample of higher education students. *Sleep Medicine*, 14, e140. <https://doi.org/10.1016/j.sleep.2013.11.316>
- Martínez-González, N., Atienza, F. L., Tomás, I., Duda, J. L., y Balaguer, I. (2021). The impact of Coronavirus disease 2019 lockdown on athletes' subjective vitality: the protective role of resilience and autonomous goal motives. *Frontiers in Psychology*, 11, 4061. <https://doi.org/10.3389/FPSYG.2020.612825/BIBTEX>
- Mon-López, D., de la Rubia Riaza, A., Hontoria Galán, M., y Refoyo Roman, I. (2020). The impact of Covid-19 and the effect of psychological factors on training conditions of handball players. *International Journal of Environmental Research and Public Health*, 17(18), 6471. <https://doi.org/10.3390/ijerph17186471>
- Mon-López, D., García-Aliaga, A., Ginés Bartolomé, A., y Muriarte Solana, D. (2020). How has COVID-19 modified training and mood in professional and non-professional football players? *Physiology y Behavior*, 227, 113148. <https://doi.org/10.1016/j.physbeh.2020.113148>
- Muriel, X., Courel-Ibáñez, J., Cerezuela-Espejo, V., y Pallarés, J. G. (2020). Training load and performance impairments in professional cyclists during COVID-19 lockdown. *International Journal of Sports Physiology and Performance*, 1(aop), 1–4. <https://doi.org/10.1123/ijsp.2020-0501>
- Oh, K. H., Wiseman, M. C., Hendrickson, J., Phillips, J. C., y Hayden, E. W. (2012). Testing the acceptance model of intuitive eating with college women athletes. *Psychology of Women Quarterly*, 36(1), 88–98. <https://doi.org/10.1177/0361684311433282>
- Pillay, L., Janse van Rensburg, D. C. C., Jansen van Rensburg, A., Ramagole, D. A., Holtzhausen, L., Dijkstra, H. P., y Cronje, T. (2020). Nowhere to hide: the significant impact of coronavirus disease 2019 (COVID-19) measures on elite and semi-elite South African athletes. *Journal of Science and Medicine in Sport*, 23(7), 670–679. <https://doi.org/10.1016/j.jsams.2020.05.016>
- Pons, J., Ramis, Y., Alcaraz, S., Jordana, A., Borrucco, M., y Torregrossa, M. (2020). Where did all the sport go? Negative impact of COVID-19 lockdown on life-spheres and mental health of Spanish young athletes. *Frontiers in Psychology*, 11, 3498. <https://doi.org/10.3389/fpsyg.2020.611872>
- Reyes-Olavarria, D., Latorre-Román, P. Á., Guzmán-Guzmán, I. P., Jerez-Mayorga, D., Caamaño-Navarrete, F., y Delgado-Floody, P. (2020). Positive and negative changes in food habits, physical activity patterns, and weight status during COVID-19 confinement: associated factors in the Chilean population. *International Journal of Environmental Research and Public Health*, 17(15), 5431. <https://doi.org/10.3390/ijerph17155431>
- Rivas, T., Bersabé, R., Jiménez, M., y Berrocal, C. (2010). The eating attitudes test (EAT-26): reliability and validity in Spanish female samples. *Spanish Journal of Psychology*, 13(2), 1044–1056. <https://doi.org/10.1017/S1138741600002687>
- Royuela Rico, A., y Macías Fernández, J. A. (1997). Propiedades clinimétricas de la versión castellana del cuestionario de Pittsburgh. *Vigilia-Sueño*, 9(2), 81–94.
- Ruiz-Frutos, C., Delgado-García, D., Ortega-Moreno, M., Duclos-Bastías, D., Escobar-Gómez, D., García-Iglesias, J. J., y Gómez-Salgado, J. (2021). Factors related to psychological distress during the first stage of the COVID-19 pandemic on the Chilean population. *Journal of Clinical Medicine*, 10(21), 5137. <https://doi.org/10.3390/JCM10215137>
- Ruiz, R., de la Vega Marcos, R., Poveda, J., Rosado, A., y Serpa, S. (2012). Análisis psicométrico de la escala de resiliencia en el deporte del fútbol. *Revista de Psicología Del Deporte*, 21(1), 143–151.
- Scheid, J. L., y De Souza, M. J. (2010). Menstrual irregularities and energy deficiency in physically active women: the role of ghrelin, PYY and adipocytokines. *Medicine and Sport Science*, 55, 82–102. <https://doi.org/10.1159/000321974>
- Steenekamp, T., Zaslona, J., Gander, P., Rowlands, D., y Signal, T. L. (2020). Sleep/wake behaviour of competitive adolescent athletes in New Zealand: insight into the impact of early morning training. *Sleep Medicine*. <https://doi.org/10.1016/j.sleep.2020.11.023>
- Topp, C. W., Ostergaard, S. D., Sondergaard, S., y Bech, P. (2015). The WHO-5 Well-Being Index: a systematic review of the literature. *Psychotherapy and Psychosomatics*, 84(3), 167–176. <https://doi.org/10.1159/000376585>

- Villaseca-Vicuña, R., Pérez-Contreras, J., Merino-Muñoz, P., González-Jurado, J. A., Aedo-Muñoz, E., Villaseca-Vicuña, R., ... Aedo-Muñoz, E. (2021). Effects of COVID-19 confinement measures on training loads and the level of well-being in players from Chile women's national soccer team. *Revista de La Facultad de Medicina*, 69(1). <https://doi.org/10.15446/REVFACMED.V69N1.88480>
- von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C., Vandenbroucke, J. P., y STROBE Initiative. (2008). The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Journal of Clinical Epidemiology*, 61(4), 344–349. <https://doi.org/10.1016/j.jclinepi.2007.11.008>
- Wagnild, G. M. (2009). A review of the resilience Scale. *Journal of Nursing Measurement*, 17(2), 105–113. <https://doi.org/10.1891/1061-3749.17.2.105>
- Wagnild, G. M., y Young, H. M. (1993). Development and psychometric evaluation of the Resilience Scale. *Journal of Nursing Measurement*, 1(2), 165–178.
- World Health Organization. (2020). *Coronavirus disease (COVID-19)*. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>