





Article

# Training Conditions and Emotional Impact on Spanish Olympic Swimmers and Rowers in Social Isolation Due to COVID-19. Results of a Survey

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**Citation:** Moscoso-Sánchez, D.; Alarcón-Rubio, D.; Trujillo-Carmona, M.; Jaenes-Sánchez, J.C. Training Conditions and Emotional Impact on Spanish Olympic Swimmers and Rowers in Social Isolation Due to COVID-19. Results of a Survey. *Sustainability* **2021**, *13*, 11148. <https://doi.org/10.3390/su132011148>

Academic Editors: Emiliano Ce, Giuseppe Coratella, Stefano Longo and Christian Doria

Received: 2 August 2021

Accepted: 6 October 2021

Published: 9 October 2021

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**Abstract:** This article analyzes the results of a survey conducted in 2020 with Spanish Olympic swimmers and rowers, who were confined to their homes due to the epidemiological crisis. The questionnaire was administered between 23 April and 25 May. Responses to the questionnaire on emotional and adaptive reactions during the COVID-19 confinement (REACOV-19) were received from 88 subjects, who represented 100% of the total population of Spanish Olympic swimmers and rowers. Through this questionnaire, they were asked about their living conditions, their daily training habits and their psychological, cognitive and emotional adaptation during the confinement. The results show the commitment of these athletes to their sports goals and their responsibility in respecting the confinement rules. Sixty-seven per cent of them stated that they had not left their homes for 96 days. In these extreme circumstances, the majority trained an average of 11 to 13 h a week and coped with the confinement with a positive attitude, in spite of the inconveniences of social isolation, the lack of equipment and technical support for training and the limitations of their physical space. The article analyzes which emotional and social factors influenced both their motivation and their hours of training.

**Keywords:** Olympic swimmers and rowers; social isolation; epidemiological crisis; COVID-19; Spain

## 1. Introduction

As a consequence of the world epidemiological crisis of SARS-CoV-2 (known as COVID-19), the Spanish government decided to adopt unparalleled measures regarding mobility and social distancing. The most important measure was the home confinement for all of those who did not carry out essential activities (related to health, education, safety, food supply, etc.), except for the strict acquisition of food and medicines. In this context, sport in Spain was paralyzed, a unique situation in modern history which forced the athletes to confine themselves to their homes for nearly two months, due to the postponement of all training and sports events, important leagues and championships.

Many studies have been carried out in this country on sports habits and behaviors in the population. The well-known Survey on Sports Habits in Spain, part of the official statistics collected in the country, has been conducted by the Center for Sociological Research (CIS) every 5 years since 1980. In the context of sports sociology, research has also been carried out on high-level athletes [1], especially on their profiles and professional careers [2,3]. Traditionally, however, it has been the field of sports psychology that has devoted greater efforts to studying aspects related to the motivation, mood and environmental and emotional conditions of Olympic athletes [4–7].

Notwithstanding these studies, there are no antecedents of analysis of the situation of athletes in contexts of isolation, in spite of there being some cases in elite sport of individuals who have suffered isolation in war scenarios. After a comprehensive bibliographic review in the main reference sources, no studies were found on this topic in the past. The studies that we found were published between 2020 and 2021. However, there are also no specific studies on Olympic athletes in isolation contexts, this study being the first to analyze the training conditions and the emotional impact of Olympic swimmers and rowers in Spain.

The publications that exist are recent and arose from the present epidemiological crisis, mostly studying the emotional impact on high-level and Olympic athletes [8–17]. In general, the results show their need for psychological and physical support during confinement and the return to competition. Thus, guidelines and recommendations have been published on the initiative of the Spanish Rowing Federation and the International Society of Sport Psychology (ISSP) to help them overcome this situation in the best way possible.

Some authors [18,19] suggest that the effect of the COVID-19 pandemic is associated with mental and physical health challenges in athletes; and periods of inactivity, isolation from athletic teams, distance from the athletic community, less qualified interactions with athletic coaches and lack of social support have also been shown to cause emotional distress and psychological disorders in athletes.

As a consequence of the COVID-19 pandemic, recent research has warned about the effect of confinement and social isolation on athletes' physical activity and mental health [20]. Home confinement has meant a drastic change in athletes' training routines [19,21], and although they attempted to maintain their physical activity during confinement, a reduction in training time and intensity was observed [21–23]. During the confinement period, the quality of athletes' sleep was also reduced [24,25], and at the same time an increase was evident in the number of sedentary activities [23–28].

Social distancing is another potential stressor due to the home confinement caused by COVID-19 [20]. Reduced social relationships and companionship in sports practice is associated with a longer period of sedentary activities and reduced well-being [29–31]. In addition, due to confinement, athletes perceived a deprivation of personal contact with their coaches and psychological support, and symptoms of mental illness such as stress and depression have thereby increased [32–35].

There are 5,337 high-level athletes in Spain, of whom only 383 are Olympic athletes from the different disciplines and modalities [36]. While the high-level athletes are selected by the Higher Sports Council (CSD), the maximum organ that regulates national sport and belongs to the Spanish Ministry of Culture and Sport, at the proposal of their sports federations, the Olympic athletes are designated by the Spanish Olympic Committee (COE) and awarded grants from Aids to Olympic Sports (ADO). Thanks to these aids, the Spanish high-level and Olympic athletes are provided with resources and human services, accommodation and technical means for their training and sporting excellence. They are athletes who establish their sports objectives in the short, medium and long term, and who formed part of the Olympic team for the Olympic Games of Tokyo 2020 (now Tokyo 2021).

During the months of confinement, these Spanish Olympic athletes were training in their homes and suffering a great deal of anxiety regarding their future, given the fact that the opportunity cost of a sports career is high (at the personal, family, educational and professional levels, outside the field of sport) [37]. The situation experienced during the confinement was one of extreme anxiety, because many of them saw their training and competition calendars interrupted, without the necessary help in technical material and without access to sports equipment, except for the basic items which are found in many homes (weights, resistance bands, stationary bikes, etc.), during their isolation in their places of residence.

Some meta-analyses have shown that the COVID-19 crisis has had negative effects on the mental health of the general population [38–40]. Some risk factors for suffering from these negative psychological symptoms have been lacking support networks during

confinement, excessive media exposure to information about the incidence of COVID-19 and uncertainty about employment [39].

Numerous studies have shown that due to the COVID-19 confinement an inverse association has been observed between reduced physical activity and well-being in the general population [41,42], and especially with negative consequences for mental health, as the symptoms of stress and depression increase due to a lack of physical activity [43–45]. Athletes are an especially at-risk group for suffering these negative psychological consequences; reduced physical activity has had a negative effect on their sports performance, and with it increased their stress and negative mood states [46–50].

The present study sheds light on the training conditions and emotional impact experienced by a group of Spanish Olympic swimmers and rowers during the period of confinement. It is a pioneering study that presents key aspects of the exceptional training conditions of Olympic athletes in Spain, although we believe that the results may be extrapolated to other countries. Using a survey administered with the support of the sports federations, 88 subjects were interviewed, representing 100% of the population from these disciplines and 23% of the total number of Spanish Olympic athletes.

In conclusion, it is worth mentioning the enormous challenge that was involved in collecting and analyzing the survey results obtained using one of the few means available during the period of confinement and the state of alarm. In fact, during the context of the confinement experienced in Spain in 2020, there were few options to contact the population that was confined to home by the epidemiological crisis except by using a telephone survey or a self-administered one on the Internet. This is explained by the fact that, during the state of alarm decreed by the Spanish government because of COVID-19, it was physically impossible to carry out interviews or ethnographic work in person.

The results of the study have served to issue a report with recommendations for the design of a protocol for Olympic athletes to improve their training conditions and reduce the emotional impact in the face of future epidemiological crises.

## 2. Methodology

The investigation consisted of the administration of a questionnaire on the living conditions, training habits and emotional states experienced by a population of Olympic athletes in Spain during the period of confinement. The survey was conducted via the Internet, following the model defined by [51] (page 5): “A web survey is the mode of conducting surveys which uses self-administered questionnaires housed in a web server connected to Internet, accessed by the responders through their web browser”. This survey was designed and administered using the Google Form tool, which is a safe tool because the access to the database generated is limited to the users who administer the questionnaire [52].

Different methodologies have analyzed the use of Internet surveys in the last few years [52–55]. These authors underline that “a retrospective view of the evolution of the collection of information using a survey reveals that computer assisted interviewing (CAI) is gradually replacing traditional in person interviews. This type of computer-administered questionnaires, as well as using all the available types of questions (single answer, multiple choice, textual or numerical answer, etc.), is simpler to administer because it—automatically—makes ‘jumps’ caused by filter questions, complex routes, etc., and no less importantly, makes it possible to establish rules of consistency that are confirmed before the information is recorded” [56] (page 138).

In the case of the present investigation, some of the experts’ recommendations have been followed in the use of this type of data collection techniques [45,46,52,57], like the definition of the objective and the profile of the population sample, the choice of the general design of the survey and the validated questionnaire, and the delimitation of the protocol for contacting the responders.

We are conscious that Google Form is not an ideal tool for a web survey. However, without the capacity to act with agility in another way, as a consequence of a completely

unforeseen historical event and of the suspension of economic activity in Spain—which prevented us from contacting multidisciplinary research teams, unable to continue their professional activity—the optimal execution of the survey was very difficult to achieve.

### *2.1. Questionnaire*

The research team agreed on the design of the questionnaire, starting with the search for references in Medline and Google Scholar, with the aim of finding examples of studies with people in situations of isolation. The team also contacted Dr. Manuel Trujillo, Professor of Psychiatry at New York University and Chief of Psychiatry at Bellevue Hospital, an expert in this type of situation.

Both the recommendations of Dr. Trujillo and the short version of the POMS questionnaire by Andrade [58] for adult athletes and the general population were of great help, and were complemented with questions about the impact of confinement on areas such as sleep, concentration and mood state. The construction of the questionnaire was aimed at gaining more information about their psychological, cognitive and emotional adaptation.

Once the questions and answer options had been drawn up, the research team debated the questionnaire and arrived at a consensus on its final version, entitled Emotional and Adaptive Reactions to the COVID-19 Confinement (REACOV-19) [13,48]. In total, the questionnaire comprised 43 questions.

The questionnaire was initially tested on a sample of 10 athletes to confirm that it was appropriate and understandable. Four coaches and four sports psychologists, blinded to the study objectives, were recruited for the validation as recommended by Osterlind [59], with a Likert scale to assess the comprehension and adequacy of the items. The questionnaire measurement model was validated using a Confirmatory Factor Analysis (CFA) in a sample of 1248 Spanish athletes, reaching an acceptable model fit and reliability indicators [37].

Among the questions, there was a first block on sociodemographic characteristics, where information was sought on age, sex and educational level, as well as the country and region of residence. The second block asked for information on the conditioning aspects of the athletes' lives during the confinement: the size of their homes, the availability of open space, their family's working situation and their leisure activities. The third block requested information about the type of activity that they carried out and their level of dedication, training habits and equipment, information on monitoring by their coaches and information received from the clubs or federations, etc., during the confinement. The fourth block asked their opinion on the postponement of the Olympic Games and the effect that it would have on their sports career. Lastly, a fifth block collected data on their psychological, cognitive and emotional adaptation, in the situation of confinement that existed in Spain at that moment.

### *2.2. Administration of the Survey*

Once the survey had been designed and validated, it was tried out with a pre-test on ten high-level athletes, five coaches and three sports psychologists, to guarantee that the questions were perfectly understandable and did not give rise to confusion. From the first days of confinement, the questionnaire began to be disseminated using the list of contacts of the Spanish Rowing Federation, the Royal Spanish Swimming Federation and the Andalusian Center for Sports Medicine (CAMD) in the Department of Education and Sport of the Andalusian Regional Government. The questionnaire was administered between 23 April and 25 May.

### *2.3. Sample*

All the Olympic athletes participating in the study were from the disciplines and modalities of swimming and rowing, and represented the total population with this profile. They were 88 Olympic swimmers and rowers, 65 from the different swimming disciplines (swimming, water polo, synchronized swimming, diving and open waters) and 23 from two rowing modalities (Olympic rowing and sliding seat rowing); 54% were men and 46%

women. The mean age of the athletes was 21.64 years. Regarding their educational level, the majority had completed secondary education (41%), a degree (31%) and post-graduate studies (12%). Most of these athletes lived in the following regions: Catalonia (51%), Andalusia (11%), the Canary Islands (9%), the Valencian Region (6%), the Madrid Region (6%) and Murcia (6%).

#### 2.4. Data Analysis

The strategic decisions adopted to take advantage of the results were as follows: First, the data obtained through the survey were processed following a scrupulous cleaning of the matrix. Once the valid data base for the analysis of the results was defined, we converted the original “xml” source code from the Excel spreadsheet to a “sav” source code to adapt it to the Statistical Package for the Social Sciences version 25.

Second, mostly descriptive statistics were calculated as frequency and cross tables, to obtain a first description of the material and social conditions, the training conditions and the different dimensions of the emotional impact of the athletes during confinement.

Third, the descriptive results motivated some important questions and hypotheses:

(a) A first hypothesis was that the smaller size of the house, the loss of family jobs and the lack of adequate sports equipment would be the factors that would most affect athletes in their training.

(b) A second hypothesis was that the emotional impact caused by the suspension of their training and competitions would also have influenced the emotional impact.

To test the hypotheses, some inferential statistics were also calculated to ascertain the relations among variables, like Spearman’s correlation ( $\rho$  (rho)) and principal component analysis (CATPCA). This allowed us to examine which factors could most influence the training hours of these athletes. The CATPCA is a statistical information reduction technique. In our study, this technique served to summarize the information contained in 36 variables into only 2 dimensions.

### 3. Results

#### 3.1. Material and Social Conditions of the Confinement

The material and social conditions experienced by the athletes during the confinement were measured with different variables.

In the first place, the questionnaire inquired about the home conditions in which they found themselves during the confinement, in particular the dimensions of the home where they spent the confinement and the availability or not of a terrace or garden. The results show that the home conditions in which the athletes spent the confinement were very dissimilar: 13% lived in homes of less than 70 m<sup>2</sup>, 31% in homes measuring between 70 and 90 m<sup>2</sup>, 29% in homes measuring from 90 to 120 m<sup>2</sup> and, finally 28% in homes of more than 120 m<sup>2</sup>. Equally, while 66% said that they had a terrace or garden, 34% of the Olympic athletes spent the confinement in closed apartments without gardens or terraces.

In the second place, they were asked about their compliance with the rules of confinement ordered by the Spanish government during this period. Practically all the athletes responded that they had respected the confinement rules a lot, or quite a lot (99%), with 67% stating that they did not leave their home even when they were given permission to go out with their underage children, from April 26 on. Furthermore, 76% believed that it was necessary to respect the quarantine. This means that the majority of the Spanish Olympic athletes surveyed spent 96 days without leaving their homes, including in situations in which they were called to participate in the Tokyo 2020 Olympic Games. All of this demonstrates that, either due to responsibility or to guarantee their health with a view to their sports interests, the majority of these athletes strictly complied with the confinement in their homes. It could be that this was because of the fear of catching COVID-19, which would have affected the smooth continuity of their sports careers.

In the third place, the analysis of the material and social conditions of the athletes during the confinement also took into account the working situation of the family members

due to the epidemiological crisis, as it was considered that it could possibly influence their moods. This indicator was incorporated to ascertain the level of emotional pressure experienced in the family during the confinement. The results show that 37% of the Olympic athletes stated that someone in their family had lost their job, and 78% of these had this happen to one of their parents or siblings.

Finally, they were asked what leisure activities they carried out during the confinement to tackle their boredom. The responses highlight the activities related to the use of digital technology and communication: social networks (94%), videoconferences or calls to friends and relatives (93%) and video games (59%). They also spent their time in other traditional activities, like listening to music (93%), watching television (86%) and reading (69%). A large percentage (89%) of these athletes used their time during the confinement for studying. Furthermore, other common leisure activities were learning something new (71%) and relaxation exercises (62%).

### 3.2. Training Conditions

Regarding the training habits and behaviors of the Olympic athletes surveyed, the results show that they maintained a mean weekly training regime of 11–13 h, although some significantly surpassed this mean, as 31% trained more than 16 h per week during the confinement (see Table 1). Apart from the training hours, 84% of the Olympic athletes surveyed stated that they were able to organize themselves to be able to train.

**Table 1.** Weekly training hours.

Less than 5 h	0%
5 to 7 h	24%
8 to 10 h	16%
11 to 13 h	25%
14 to 16 h	5%
More than 16 h	31%
Mean	11–13 h/week

Source: Authors' own.

In spite of everything, 50% said that during this period they had lost quite a lot or a lot of their physical fitness. As they are athletes that need to use aquatic facilities and equipment to develop part of their training, during the confinement and the state of alarm in Spain they did not have access to them or to any other sports equipment except for the most basic kinds which are usually found in the home (weights, stationary bikes, resistance bands, mats, etc.), so that during a period of up to 96 days their training was limited to the opportunities they had at home, which were insufficient for training at this level. Therefore, the dedication that the surveyed athletes devoted to their training shows that, beyond the difficulties deriving from the social isolation and the epidemiological crisis, these Olympic athletes had an enormous amount of will power and capacity to maintain their training under extreme conditions.

With respect to the logistic conditions during the confinement, the results show that 67% were able to count on “little” or “no” suitable equipment for training at home. Regarding the monitoring of their training sessions by their coaches, 64% said that they were able to count on “quite a lot” or “a lot” of support from them. Apart from monitoring the training, when they were asked whether the federation informed them about the evolution of the situation in their sport, 53% of the Olympic athletes answered that they received little or no information. On this point, it should be clarified that the sports federations did not receive sufficient information from the national government or the regional governments. Furthermore, as there was a state of alarm, the officials from the



sports federations could not continue with their activities during the confinement, as all non-essential economic activity in the country had been suspended.

In this context, it is normal that half the Olympic athletes surveyed (51%) declared that they had found it quite or very difficult to motivate themselves to train. Bearing in mind the cost in personal and professional opportunities that a sports career implies, the reaction of the athletes from the point of view of motivation manifests their strength of character and their will power with regard to their sport objectives.

With regard to their anxiety over the holding of the 2020 Tokyo Olympic Games, 98% considered the postponement advisable, an almost unanimous response, in spite of the fact that 34% of the Olympic athletes participating in the survey said that they had been affected by the postponement of the Olympic Games. It may be that some of them were in optimal form to participate in these Games, and perhaps others were of an age and category that meant they could be excluded as they were postponed, or perhaps they still had to compete in decisive events to be able to take part in Tokyo. Moreover, in spite of the enormous opportunity cost which these athletes incurred with the postponement of the 2020 Tokyo Olympic Games, the situation caused by the epidemiological crisis of the coronavirus provoked many spontaneous reactions, in the whole world, on the part of Olympic athletes, who organized themselves and issued public statements denouncing the pressure that they were receiving from the international federations and sponsors to compete, at all costs, in the programmed sport events [34].

### 3.3. Emotional Impact

The questionnaire administered in this study also tackled different aspects of the psychological, cognitive and emotional adaptation of the Olympic athletes, faced with the situation of confinement experienced in Spain.

A first block of questions on this topic aimed to collect information on the individual cognitive-emotional and environmental conditions. The responders were asked about their self-perception regarding sleep, concentration, irritability, fear of the possibility of a relative dying, possible obsessive behaviors or rituals that could have arisen momentarily or their eating regime.

The data show that 8 out of 10 Olympic athletes experienced, to different degrees and in different ways, more irritability than normal (48% to a considerable extent), sleep disturbances (47% to a large degree), difficulties to concentrate (43% just a little), fear of the possibility of a relative dying due to COVID-19 (28% to a considerable extent) or moments of anxiety (the majority only a little, 42%). To a lesser extent than the aforementioned tendencies, they experienced the appearance of obsessive behaviors or rituals that they did not have before (31% a little and 10% a great deal), and they ate more than usual (16% say quite a lot or a lot). The results of the survey also show that 43% had some fierce arguments with other people for trivial reasons.

The second block of questions inquired about different emotions and mood states experienced during the state of alarm. In a framework of answer options from 1 to 5 for each one, where 1 meant “no” experience related to the listed emotions, 2 “a little”, 3 “quite a lot”, 4 “a lot” and 5 “a great deal”, the analysis of means shows the emotional states experienced by the Spanish Olympic swimmers and rowers during the state of alarm decreed because of the epidemiological crisis.

Table 2 groups the emotions experienced and their values as a function of the mean levels of each (“high level”, “medium level” and “low level”). The first group includes those that manifested a high level of representation with a mean of about 3 to 4, relating to the options of “quite a lot” and “a lot”. The emotions and feelings exclusively shown here could be undoubtedly qualified as “positive”: friendly, understanding, helpful, considerate and kind. A second group includes those emotions that scored around the mean (“a little” and “quite a lot”), within a range from 2.25 to 2.75. This group includes a greater variety of emotions, although most of them have in common mood states related to restlessness, tiredness and discomfort: positive, nervous, active, restless, tired, agitated, tense, weary,

melancholic, full of energy, fatigued, upset and irritable. Lastly, a third group of emotions scored at a low mean level (“no” or “a little”), showing a lower frequency among the surveyed athletes. This third group of emotions referred to aspects with an emotional load which could be considered mainly “negative”: bad tempered, despairing, angry, weak, exhausted, resentful, lonely and unhappy.

**Table 2.** Emotions experienced during the state of alarm by Spanish Olympic Athletes (means).

High Level (quite a lot—a lot)		Medium Level (a little—quite a lot)		Low Level	
Friendly	3.26	Positive	2.74	Bad tempered	2.19
Understanding	3.11	Nervous	2.72	Despairing	2.19
Helpful	3.06	Active	2.65	Vigorous	2.15
Considerate	3.04	Restless	2.62	Angry	2.03
Kind	2.96	Tired	2.53	Weak	2.03
		Agitated	2.43	Exhausted	1.97
		Tense	2.42	Resentful	1.95
		Weary	2.42	Lonely	1.81
		Melancholic	2.41	Unhappy	1.81
		Full of energy	2.36		
		Fatigued	2.31		
		Upset	2.30		
		Irritable	2.25		

Source: Authors' own.

### 3.4. Correlation between the Hours of Training and the Different Material, Social, Emotional and Logistic Factors

After obtaining the results of the survey, we wondered what factors could have influenced the athletes' training hours. We started with the hypothesis that factors like the size of their homes, the monitoring by their coaches or the emotional impact on each athlete could have influenced their training hours.

To clarify this issue, and bearing in mind that the size of the sample represented 100% of the Spanish Olympic athletes in the disciplines of swimming and rowing, we performed a Spearman correlation  $\rho$  (rho), the results of which are very important for the establishment of future strategies for the Olympic teams if faced with health crises which demand the home confinement of the athletes for long periods.

In contrast to what we researchers thought with regard to the material, social and logistic conditions of the athletes (see Table 3), the size of their homes and whether or not they had a garden or terrace was the factor that least influenced their training hours. However, the monitoring or lack of it on the part of the coach (0.388), the information provided by the federation on the situation of the sport (0.360), the availability of adequate equipment for training (0.348) and the capacity of the athletes to organize themselves (0.338) were the factors which most influenced the training hours.

Regarding the emotional situation of the athletes (see Table 3), the results show that the factor which most influenced the training hours was their capacity to keep motivated during the confinement (−0.399) and, next, the availability and access to psychological assistance (−0.311). Sleep disturbances (−0.138) and irritability (−0.104) also exerted an influence, although to a lesser degree than the former factors.



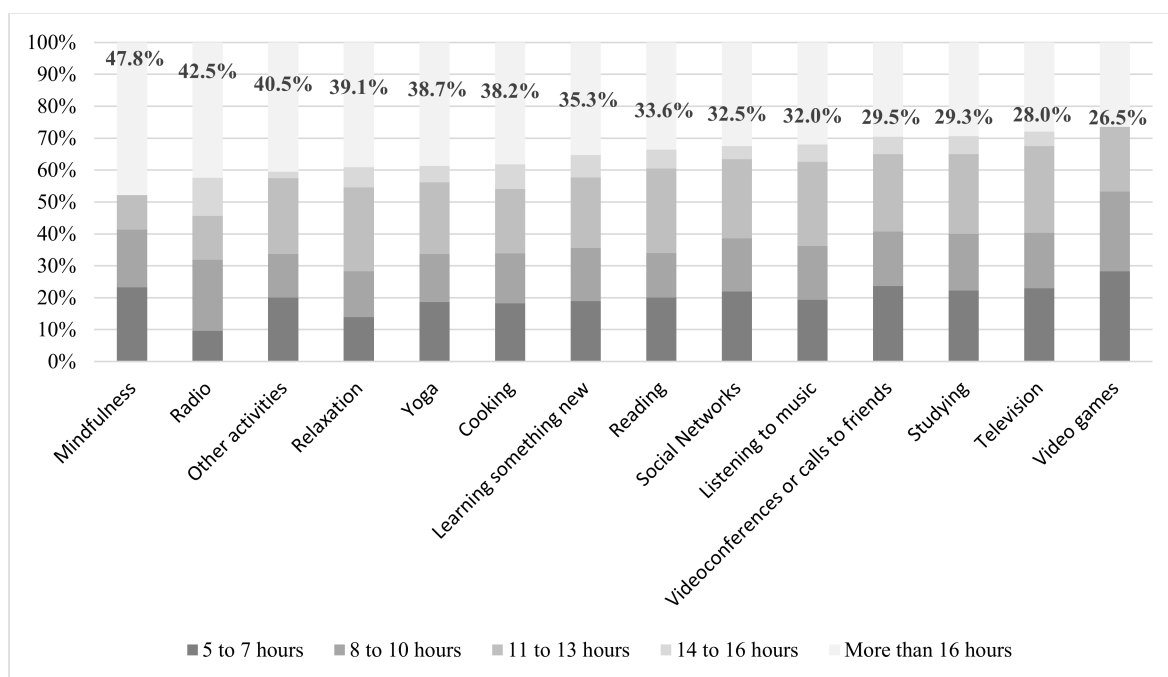
**Table 3.** Spearman's correlations test.

<b>Spearman's correlations among material, social and sports conditions and training hours</b>	
During confinement, did your coach monitor you?	0.388
During confinement, did your federation inform you about the evolution of the situation in your sport?	0.36
During confinement, did you have equipment for adequate training?	0.348
During confinement, could you organize yourself to train?	0.338
During confinement, did your club or team inform you about the situation of your sport (if there were competitions or not, if some sports events were cancelled, etc.)?	0.23
Did you have a garden or outdoor terrace during confinement?	−0.110
Square meters of the place of confinement	0.044
<b>Spearman's correlations between emotional situation and training hours</b>	
In general, has it been difficult to keep motivated for training?	−0.399
Have you had access to a psychologist?	−0.311
Have you received any psychological information during this time?	0.27
Have you been afraid that a relative might die?	0.174
Have you consulted a psychologist during this time?	0.149
Have you had sleep disturbances/difficulties?	−0.138
Have you had any fierce arguments for trivial reasons?	−0.104
<b>Spearman's correlations between moods and training hours</b>	
Have you felt ... vigorous?	0.365
Have you felt ... active?	0.312
Have you felt ... positive?	0.253
Have you felt ... full of energy?	0.242
Have you felt ... melancholic?	0.193
Have you felt ... considerate?	0.172
Have you felt ... exhausted?	0.161
Have you felt ... helpful?	0.147
Have you felt ... kind?	0.145
Have you felt ... tired?	0.131
Have you felt ... resentful?	0.131
Have you felt ... friendly?	0.128
Have you felt ... weak?	−0.151

Source: Authors' own.

With regard to mood states and their correlation with training hours (see Table 3), the main mood states that correlate with more training hours are positive: vigorous (0.365), active (0.312), positive (0.253) and full of energy (0.242). In second place, other positive mood states also influenced the training hours: considerate (0.172), helpful (0.147), kind (0.145) and friendly (0.128). However, it was revealed that some negative mood states can also influence the training hours, although to a lesser extent: melancholic (0.193), exhausted (0.161), tired (0.131) and resentful (0.131). The only mood state that appeared to be negatively related to the training hours was weakness (−0.151): those that felt weak trained for fewer hours.

Lastly, we wanted to discover if there was a relation between the leisure activities performed by the Olympic athletes in their confinement and the training hours (see Figure 1). The results highlight an important trend: those who spent more time with digital leisure pastimes (video games, video conferences, television and social networks) spent less time training, and those who spent their leisure time in relaxing activities (mindfulness, relaxation, yoga, cooking, learning something new or other activities) trained more hours on average during the confinement. At the extremes, among those who practiced mindfulness during the confinement, 48% trained during 16 or more hours per week, and among those that spent their time playing video games, 27% (twenty points less) trained 16 or more hours per week.



**Figure 1.** Training hours according to the leisure activities performed (%). (Source: Authors' own).

### 3.5. Analysis of Principal Components That Influenced Training Hours

To summarize the prolific information obtained from the survey on the emotional situation of the athletes during the confinement, a categorical principal component analysis (CATPCA), was conducted, as the variables used were neither continuous nor ordinal [60].

This analysis was used to confirm the weight and relation that the emotional components had regarding the subjects' training hours. Thirty-five variables were included (see Table A1 in Appendix A), and the results analyzed were reduced to two dimensions (see Table 4). To facilitate the understanding of the dimensions, the sign of the variables that have a positive sense has been changed: for example, in "have you felt active?", the highest category has been changed to "no". Thus, in all the emotional variables the highest value is always negative. Dimension 1 has an eigenvalue of 13.6, which represents 39% of the variance of the set of indicators. In this type of ordinal variables and with this type of questions, it is a very high percentage. The second dimension represents 17% of the variance, which is not as high as the former dimension but is in no way negligible. In both cases, the Cronbach's alpha is very high, which indicates great coherence among the transformed variables.

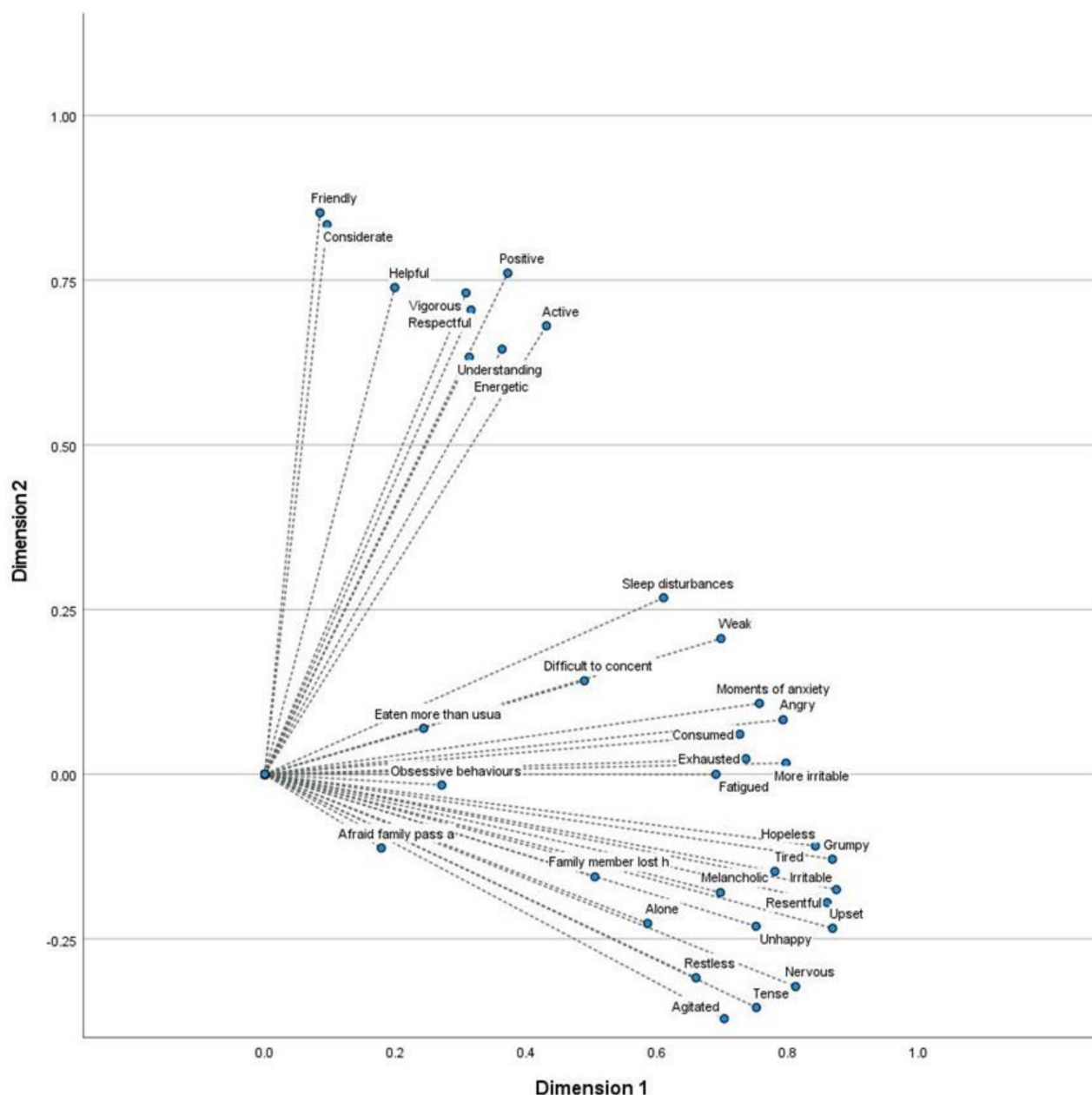
**Table 4.** Reduction of the dimensions following the principal component analysis (CATPCA).

Dimension	Cronbach's Alpha	Total (Eigenvalue)	% of Variance Explained
1	0.954	13.575	39%
2	0.853	5.831	17%
Total	0.976	19.407	55%

Source: Authors' own.

The first dimension clearly refers to the emotional state of the athlete, highlighting the questions referring to mood, irritability, bad temper, etc. The second dimension, in contrast, with a smaller number of variables, seems to refer more to questions of a social character, and thus not to the mood of the athlete, but to their relationship with other people and their physical sensations. These dimensions can be seen in Figure 2 through the positioning of each of the variables in the space formed by the two dimensions. We can see that most of the variables that describe emotional states are situated in dimension 1 with positive

values, showing the positive value of dimension 1's negative emotional states. Equally highlighted is the possibility that a relative could lose their job as a negative emotional element. Regarding dimension 2, the variables that have the most influence are a group that reflects the emotional situation, but more related to the physical sensations of the athletes and their social effects, with this dimension being positive when the variables are positive.



**Figure 2.** Analysis of principal components influencing training hours. (Source: Authors' own).

Through a new analysis of the categorical principal components (CATPCA), we summarize these two dimensions in indicators, establishing a Spearman's correlation with two variables of interest (the number of hours trained and the difficulty for maintaining motivation). The results of this analysis (see Table 5) show that the correlation with the variable related to the difficulty of maintaining motivation is very high with indicator 1, and also high, although less so, with indicator 2. Thus, motivation would be influenced by all types of emotional questions. In contrast, the training hours are not related to dimension 1,

but they are related to dimension 2. This means that the training hours do not have a direct relation with the emotional states of the athletes, but rather with the way in which their emotional situation impacts their physical-mental sensations.

**Table 5.** Spearman's correlations between emotional and social dimensions, and the difficulty of maintaining motivation and training hours.

Analysis Variables	Indicator 1	Indicator 2
Has it been difficult to keep motivated?	0.505	0.333
Training hours	−0.001	−0.226

Source: Author's own.

#### 4. Conclusions

In spite of the existence of an academic tradition concerned with the social study of sport, there is no known scenario in our recent history in which these disciplines have been systematically studied regarding habits, behaviors and sports attitudes in contexts of social isolation. In this respect, it can be said that the confinement experienced by these athletes due to the epidemiological crisis of the coronavirus has been a fully-fledged social experiment both for sports psychology and sociology. The impossibility of collecting social data from an unexpected crisis of such magnitude and the establishment of a state of alarm that prevented any type of non-essential economic and professional activity during the confinement cannot be ignored.

The strategic decision of carrying out the present study by the team coordinated by Jaenes [14] is worthy of recognition, given that the confinement experienced in the spring of 2020 is unparalleled as a social experiment, also in the world of sport, and specifically in the world of high-level and Olympic sport. In this sense, the present study is the first to analyze the training conditions and the emotional impact among Olympic swimmers and rowers in Spain.

We summarize below the key points of the study:

1. The global epidemiological crisis of SARS-CoV-2 caused the Government of Spain to decree a confinement for people who did not carry out essential activities (health, education, security, food, etc.).

2. This situation forced the suspension of training and sports events in the major leagues and championships for several months. In some cases, the athletes lacked the help of coaches and psychologists. During that time, the Spanish Olympic athletes were training at home, only with basic materials (dumbbells, elastic bands, stationary bikes, etc.).

3. In order to find out about the personal and sporting situation of these athletes, and to know how this could influence their training, a survey was carried out among Spanish Olympic swimmers and rowers. Responses were obtained from 88 subjects, that is, 100% of the total population of Spanish Olympic swimmers and rowers.

4. The main results of this survey are as follows:

In relation to material and social conditions, 73% stated that they had spent the confinement in a home with less than 120 m<sup>2</sup>, and of these 34% did not have a terrace or garden. In addition, 34% stated that a family member had lost their job. During confinement, most spent their leisure time mainly on social networks (94%), videoconferences or calls to friends or family (93%), listening to music (93%), studying (89%) or watching television (86%). Their responsibility in respecting the confinement instructions deserves to be highlighted, as 67% said they had not left home for 96 days. Despite being Olympic athletes, 98% considered the postponement of the Tokyo 2020 Olympic Games appropriate, even though 34% admitted that this postponement would affect them directly (because of their age, category, fitness, etc.).

Regarding the training conditions, all the athletes trained during confinement (regardless of the size of their homes and whether or not they had a terrace or garden, and whether or not they enjoyed the support and monitoring of coaches or technicians), and they did it without having suitable aquatic equipment; 67% did not even have adequate equipment to

train at home, but only basic sports equipment. In such extreme circumstances, the athletes trained for an average of 11 to 13 h per week, and 64% had the support of their coaches virtually. Despite this, 51% admitted that it was difficult for them to stay motivated to train, and 50% reported that during that period they had lost their fitness. After analyzing the data, the commitment of our athletes to their sporting goals and their responsibility in respecting the confinement instructions is clear. To keep training without the certainty of a competition schedule is no easy task.

Regarding their psychological, cognitive and emotional adaptation, 48% experienced more irritability than normal, 47% suffered from sleep difficulties, 35% had concentration problems, 28% were afraid of the possibility of the death of family members and 25% suffered moments of anxiety. Despite the emotional impact, the majority faced the confinement with a positive attitude, since in the emotional attitudes scale the highest values (between 2.96 and 3.26 out of 5) express having had a friendly, understanding attitude during confinement and feeling helpful, considerate and kind. The greatest manifestations of negative affection were experienced at their highest level by less than half of these athletes. All in all, the results show the need for psychological and physical support for these athletes during a confinement and on their return to competition.

Finally, we wondered what factors could have most influenced the training hours of these athletes. The Spearman correlation  $\rho$  (rho) showed that the monitoring or lack of it on the part of the coach, the information provided by the federation on the situation of the sport, the availability of adequate equipment for training and the capacity of the athletes to organize themselves had a considerable influence. Equally, the following emotional dimensions were important: feeling vigorous, active, positive and full of energy and, additionally, the capacity to keep motivated during the confinement and the availability and access to psychological assistance. Leisure activities during the confinement were also an influence, showing that those who spent more time doing relaxing activities trained for more hours and those who spent more time with digital pastimes trained for less hours. Lastly, the categorical principal component analysis (CATPCA) limited the dimensions that influenced the training hours to two groups, revealing an unprecedented conclusion: that the emotional state of the athletes during the confinement led to a state or sensation of physical-mental exhaustion which affected their motivation to train. A situation which is probably being experienced by all individual athletes during this health crisis. In fact, the results are close to those obtained in a study carried out among the sports population in Italy [61].

Our study shows that physical activity and training during confinement were associated with the mental health of Spanish swimmers and rowers. Similar results have been observed in samples of athletes from other disciplines in conditions of confinement similar to those established by the Spanish government. García-Tascón et al. [24], in a large sample of Spanish athletes from different disciplines, observed that the confinement due to COVID-19 entailed a decrease in physical activity and the intensity of training, with a negative effect on athletes' health. Mon-López et al. [25] observed, in a sample of Spanish handball players, that during confinement the reduction in the amount and intensity of training was associated with a worse sleep quality and negative emotional states.

A conclusion that we can reach from the results obtained in our study and others is that, in situations such as those produced by the confinement due to the COVID-19 pandemic in Spain, maintaining physical activity and having adequate training conditions are protective factors for the mental health of athletes. Lorenzo Calvo et al. [29], in a study on Spanish professional basketball players during the confinement period, showed that negative emotional states were associated with lower training frequency and sleep quality. Pons et al. [34], in a sample of young Spanish athletes, found that young people with worse training conditions suffered greater mental health problems. The relationship between sport, physical activity and mental health has been observed worldwide as a consequence of confinement conditions similar to those in Spain [48,62–65]. This relationship between mental health and physical activity can work both ways, Chirico et al. [59] observed, in

a sample of Italian athletes during the COVID-19 confinement, that anxiety negatively influenced the intention to do physical activity. A lesson learned for future crises is that to protect the mental health of athletes, sports organizations should implement psychological support programs combined with the promotion of training conditions and the maintenance of physical activity [7].

All in all, this study offers the possibility to understand our Olympic athletes a little more in extreme conditions and in circumstances which until now were neither known nor experienced. To conclude, the results of the study have served to issue a report that we have sent to the Higher Sports Council, the Spanish Olympic Committee and the Sport Federations of Swimming and Rowing. This report provides useful recommendations for the design of a protocol that will help Olympic athletes to improve their training conditions and reduce the emotional impact of future epidemiological crises. Among the main recommendations, three stand out. The first recommendation is that these athletes remain isolated in groups, not individually, with other athletes and with their coaches, in high-performance centers and sport residences with appropriate facilities and equipment. The second recommendation is to reduce the use of social networks and the Internet, focusing instead on relaxing leisure activities (meditation, Pilates, mindfulness, yoga, reading, etc.). The third recommendation is to provide Olympic athletes with the support of psychologists in confinement situations.

We must report several limitations. These limitations, in turn, suggest several recommendations:

1. It would have been advisable to ask about the athletes' training conditions and the subjective perception of their emotional state under normal conditions, and not only during confinement. This would have made it possible to contrast the responses in two different situations: normal and in confinement. Hence, the results of this study should not be interpreted in causal terms, but this cross-sectional analytical study can provide information on the association between risk factors and psychological health outcomes, as other studies have done. Therefore, we encourage future researchers to take this possible improvement into account. Future research will require a longitudinal study to analyze changes in emotional states and—more importantly—their connection with athletic performance.

2. Another limitation of this study is the absence of data on Olympic athletes from other sport disciplines, both individual (athletics, cycling, climbing, etc.) and collective (soccer, rugby, basketball, etc.). Hence, the results of this study should not be interpreted in causal terms, but this cross-sectional analytical study can provide information on the association between risk factors and psychological health outcomes, as other studies have done. Future research should compare the psychological and emotional effects of confinement on individual and team athletes, as well as the differences between different sport specialties, in search of an evidence-based set of interventions for each one.

Despite these limitations, we believe that the methodological decisions ensured, as much as possible, the proper conduct of the study in such a complex context, thanks to the multidisciplinary work of sociologists, psychologists, specialists in survey techniques and statisticians.

**Author Contributions:** Conceptualization, J.C.J.-S. and D.A.-R.; methodology, D.M.-S.; validation, J.C.J.-S. and D.A.-R.; formal analysis, D.A.-R., D.M.-S. and M.T.-C.; investigation, J.C.J.-S.; resources, D.M.-S.; data curation, M.T.-C.; writing—original draft preparation, D.M.-S.; writing—review and editing, J.C.J.-S. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** The data presented in this study are available on request from the corresponding author. The data are not publicly available due to the protection of personal data, in accordance with the legislation on personal data of the Spanish authorities.



**Acknowledgments:** We would like to thank Manuel Trujillo for his help in guiding the ideas for the development of the questionnaire on situations of social isolation. We also want to thank Juan Antonio Domínguez-Álvarez (Research Technician of the Higher Council for Scientific Research of the Government of Spain) for his help and guidance in the design of the web survey, given that he is a European expert on this issue.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

**Table A1.** Variables used in the principal component analysis, reduced to two dimensions. (Source: Authors' own).

Variable	Dimension 1 (Positive Is Irritable)	Dimension 2 (Positive Is Not Friendly)
Have you felt ... irritable?	0.874	−0.175
Have you felt ... bad tempered?	0.868	−0.234
Have you felt ... upset?	0.868	−0.129
Have you felt ... resentful?	0.860	−0.195
Have you felt ... despairing?	0.842	−0.109
Have you felt ... nervous?	0.812	−0.322
Have you felt ... more irritable than you usually do?	0.797	−0.017
Have you felt ... angry?	0.793	−0.083
Have you felt ... tired?	0.780	−0.148
Have you felt ... tense?	0.752	−0.354
Have you had moments of anxiety?	0.756	0.108
Have you felt ... unhappy?	0.751	−0.231
Have you felt ... exhausted?	0.736	0.024
Have you felt ... weary?	0.726	0.061
Have you felt ... agitated?	0.703	−0.371
Have you felt ... weak?	0.698	0.206
Have you felt ... melancholic?	0.697	−0.180
Have you felt ... fatigued?	0.690	0.000
Have you felt ... restless?	0.659	−0.309
Have you had sleep disturbances/difficulties?	0.610	0.268
Have you felt ... lonely?	0.585	−0.226
Has a relative lost their job?	0.505	−0.156
Have you had difficulty concentrating on what you had to do?	0.489	0.142
Have you noticed obsessive behaviors or rituals that you did not have before?	0.271	−0.016
Have you eaten more than you usually eat?	0.243	0.070
Have you felt ... friendly?	0.085	0.852
Have you felt ... considerate?	0.095	0.834
Have you felt ... positive?	0.372	0.761
Have you felt ... helpful?	0.199	0.739
Have you felt ... vigorous?	0.308	0.731
Have you felt ... kind?	0.315	0.705
Have you felt ... active?	0.431	0.681
Have you felt ... full of energy?	0.363	0.645
Have you felt ... understanding?	0.313	0.633
Have you been afraid that a relative might die?	−0.046	0.237

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