Int.J.Curr.Res.Aca.Rev.2024; 12(11): 62-67

EXCELLENT PUBLISHERS

International Journal of Current Research and Academic Review

ISSN: 2347-3215 (Online) Volume 12 Number 11 (November-2024)

Journal homepage: http://www.ijcrar.com

doi: https://doi.org/10.20546/ijcrar.2024.1211.004

Impact of Covid-19 Lockdown on Physical Activity Level and Mental Health in Physical Education Students in Brazzaville, Congo

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Abstract

The aim of the study was to assess the effects of COVID-19 lockdown on physical fitness, alertness and mood states in physical education students. A total of 51 volunteer Congolese students were assessed at one week, one month, two months and three months during COVID-19 lockdown. Physical fitness was assessed using the IPAQ questionnaire. The degree of objective vigilance was determined using the Chiffre-Symbole substitution test according to a validated procedure, while the visual analog scale was used to self-assess the seven mood states. Our results showed that the level of physical activity changed during COVID-19 lockdown. Analysis of the psychological states showed that from the first week of COVID-19 lockdown onwards, there was a decrease in general mood performance (more anxiety and clumsiness and less fit) and general alertness (more drowsiness, fatigue and less energy). In short, COVID-19 lockdown contributed to a decline in students' physical and mental health.

Article Info

Received: 22 September 2024
Accepted: 30 October 2024
Available Online: 20 November 2024

Keywords

Physical activity, mental health, vigilance, mood states, physical education students.

Introduction

The Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) pandemic began in China in December 2019, then reached 213 countries (WHO, 2020), including the Republic of Congo-Brazzaville in early March 2020. The pandemic was declared a public health emergency of international concern by the World Health Organization (WHO) on January 30, 2020 (NHCPC, 2020). The virus has reached every continent, with Europe and America being the most virulent, affecting almost every country on the planet. In Africa, the pandemic has not had the same impact, with the exception of South Africa, Morocco and Egypt. The Republic of Congo-Brazzaville has not remained on the sidelines: from March 14, 2020, when the Congolese government confirmed its first case of the COVID-19 coronavirus, to February 21, 2022, 3905 cases of COVID-19 have been diagnosed and confirmed, with a total of 378 deaths (case-fatality rate of 1.6%) (Ministry of Health and Population, 2022). Faced with this health emergency with an asymmetric impact on the socio-economic situation, several essential protective measures were taken to combat the pandemic, including the lockdown of populations to the country's two main cities: Brazzaville, the political capital, and Pointe-Noire, the economic capital and seaport on the Atlantic Ocean. The initial containment of Brazzaville's population, by government decision, included: the opening of state markets (district or neighborhood) three days out of

seven; a week-long ban on all vehicles, motorized vehicles and bicycles; a ban on leaving the district of residence; and the wearing of masks (medical or homemade). The implementation of these measures, combined with the closure of interdepartmental and international borders to stem the spread of the pandemic, had unexpected consequences for the health and fitness of athletes. Indeed, studies carried out around the world show that the COVID-19 pandemic and the health measures taken to contain it were accompanied by a radical change in people's daily activities and lifestyles, with numerous consequences. These include the significant disruption of biological rhythms (Wang *et al.,* 2020). Indeed, sleep-wake rhythms depend on a number of environmental parameters ("Zeitgeber" or time givers) to function correctly, including: exposure to daylight (Stephenson *et al.,* 2012), by far the most important synchronizer, but also daily physical activity (PA), alertness, mood states and social interactions (Potter *et al.,* 2016). In a lockdown situation, the majority of these synchronizers (light, physical activity, diet, social interactions) are strongly altered or even suppressed, which can lead to the onset of sleep disorders and sleep-wake rhythms.

What's more, exposure to these Zeitgebers can also occur at the wrong time of day (e.g., exposure to TV screens and microcomputers late at night, and in particular to blue light). It is in this context that some recent studies report an impact of COVID-19 reduction strategies on subjects' physical fitness (Ammar *et al.,* 2020; Lesser & Nienhuis, 2020). Physical activity played an important role in managing the pandemic. It has been shown that COVID19 patients, who were generally inactive, had a higher risk of hospitalization, intensive care unit admission and death (Sallis *et al.,* 2021).

Moreover, given that the relationship between positive mental health and physical activity is well established (Bull *et al.,* 2020), maintaining physical activity appeared to be crucial to well-being during the pandemic. However, the way in which physical activity is practised changed during the pandemic and especially during periods of containment.

In the Congo, the physical activities recommended by government authorities for the well-being of the population have been walking and jogging along well-established circuits. Data on athletes and students at sports science faculties are fragmentary. However, no study has established significant changes in physical activity levels, alertness and mood states in this specific population. Hence the interest of this study, which aims to assess the impact of COVID-19 lockdown on physical fitness, alertness and mood states in sport and physical education students.

Materials and Methods

Participants

A total of 51 healthy male students, aged 23.8±1.7 years and with a mean height of 1.74±0.11 m, had volunteered to take part in the study. However, only 46 of them fully completed the physical activity questionnaire and took part in all the selected tests. These subjects had been following a university training program in Physical and Sports Education for three years at the Institut Supérieur d'Education Physique et Sportive, Université Marien NGOUABI de Brazzaville (Republic of Congo). They lived in the following situations: 8.5% on their own, 2.1% as a couple, 27.4% with a family, 56.2% sharing a flat, 5.8% in a university residence. None of them showed symptoms of COVID-19. The experiment was conducted in accordance with the ethical guidelines of the Declaration of Helsinki. They were asked to avoid all sporting activities for 48 hours prior to each evaluation.

Experimental protocol

The study took place in Brazzaville during COVID-19 containment from April 9 to July 21, 2020.

Physical activity

The IPAQSF questionnaire (International Physical Activity Questionnaire Short Form, IPAQ Research Committee, 2005) was used to assess physical activity. This questionnaire records physical activity over the last 7 days. The questions to be answered are: how many days did the participants spend exercising intensively? moderately? walking? after how many hours and minutes had the specific intensity been reached? In addition to recording physical activity over the last 7 days, participants were also asked to report their pre-pandemic physical activity.

Overall activity was measured in MET minutes per week using the formula: Total METs/week = Mod (METs - min - days) + Vig (METs - min - days), where moderate intensity = 4.0 METs and vigorous intensity = 8.0 METs. The different thresholds or "Cut-Point Values" are organized as follows: sedentary activity (0-100 cpm); light activity (101-2295 cpm); moderate activity (2296-

4011 cpm); vigorous activity (≥ 4012). The questionnaire was administered to participants at one week, one month, two months and 3 months of COVID-19 lockdown.

Vigilance and mood measures

The degree of objective vigilance (OV) was determined using the Digit-Symbol Substitution Test (DSST), according to Wechsler's procedure (2003), by coding-decoding a system of digits into symbols over 90 seconds. The subject's performance corresponds to the number of correctly filled-in boxes.

The Visual Analog Scale (VAS) was used for self-assessment of seven mood states based on a 10 cm horizontal visual scale defined by Hindmarch (1980). The first three states related to general alertness (energetic, sleepy and tired), and the remaining four states involved general mood (happy, fit, anxious and clumsy). Levels of general alertness (GA) and general mood (GM) were calculated using the formulas proposed by Monk (1989).

GA= [energetic + 200 – (drowsiness + fatigue)]/4

GM=[happy + physical form + 200 - (anxious + clumsiness)]/4

These tests were administered to participants at one week, one month, two months and 3 months of COVID-19 lockdown after completion of the physical fitness questionnaire.

Operational definitions

Objective vigilance is defined as the neurocognitive capacity to maintain wakefulness, measured experimentally by the DSST test.

General vigilance is the ability to maintain wakefulness, measured using scales that best describe the current state.

General mood is the set of psycho-affective states experienced by a subject at a given moment.

Statistical analysis

Changes in physical activity levels during COVID-19 lockdown from April to July 2020 were analyzed using univariate analysis of variance (ANOVA). Chi-square tests were performed to determine whether there was a significant impact between the types of physical activity performed during lockdown. In addition, the relationship between physical activity measured with the IPAQ and measures of well-being (general alertness, mood states) was investigated using Pearson correlation analysis. The significance level was set at 5%. Data were processed using Statistica software version 13.0.

Findings

The IPAQ results indicate a change in physical activity levels during lockdown. During the pandemic, 23.32% of participants recorded low levels of physical activity, 25.56% moderate and 51.12% high. Figure 1 illustrates the different levels of physical activity.

With regard to participants' mental health, ANOVA revealed a strong, negative relationship between fasting and mean DSST scores (Table 1) during the first three months: -21.03% in month one ($p<0.009$), -20.03% in month two ($p<0.044$) and month three (-19.74%; $p<0.042$). It also revealed a reduction in general vigilance at month one (-20.08%; $p<0.0002$) and month two (-18.79%; $p<0.045$), as well as that of GM at month one (-23.57%; $p<0.001$), month two (-16.07%; $p<0.003$) of COVID-19 lockdown.

Results and Discussion

Our findings showed that physical activity levels changed during COVID-19 lockdown. This is not surprising, given the restrictions on indoor sports such as team sports and swimming. Moreover, the importance of activities such as yoga as a preventive strategy in the pandemic was also verified by a study by Sawant *et al.,* (2021). In addition, online fitness programs have been chosen in developed countries to enable populations to achieve moderate to high levels of activity, as shown in the study by Parker *et al.,* (2021). These authors report a high rate of people practicing sport or physical activity using these digital means. In the Congo, the impoverishment of households and families is a constant. Looking for something to eat during the COVID-19 lockdown period was the population's primary concern. In addition, untimely power cuts prevented people from downloading programs from the Internet.

The study of our subjects' psychological states showed, from the first week of COVID-19 lockdown onwards, a decline in HG performance (more anxiety and clumsiness and less fit), VG (more drowsiness, fatigue and less energy) and DSST. This deterioration was greatest (-20.08) at the start of COVID-19 lockdown

(shock effect), then increasingly reduced towards the end of the latter, reflecting the subjects' adaptation process to fasting conditions. Indeed, decreases in objective vigilance (DSST) (Baalbaki *et al.,* 2021) and attention (Stroop test) (Li *et al.,* 2020), memory and verbal learning (CogState test) (Rodriguez-Rey *et al.,* 2020) were also observed in sedentary and athletic subjects during the first month of COVID-19 lockdown.

These aspects are accompanied by psychophysiological disturbances manifested by decreased physical vigor (Xiang *et al.,* 2020), increased sensations of physical fatigue (Brooks *et al.,* 2020), thirst and hunger (Brooks *et al.,* 2020), headaches, dizziness (Brooks *et al.,* 2020), headache, drowsiness and digestive disorders during high physical load exercise (Brooks *et al.,* 2020); this is consistent with our quantitative findings suggested above. The deterioration of these functions is the consequence of the disruption of the sleep-wake cycle (Naser *et al.,* 2020), the change in dietary practices (in terms of timing and nature) and the lack of energy intake observed during COVID-19 lockdown. Beta-endorphins appear to be involved in these responses to sleep disruption (Naser *et al.,* 2020) and hypoglycemia (Mougin *et al.,* 1992). These hormones are known to modify mood, raising the pain tolerance threshold and stimulating glycolysis, gluconeogenesis and lipolysis (Mougin *et al.,* 1992; Pilardeau, 1995).

Table.1 Changes in psychophysiological data (objective vigilance, general vigilance and moods) during lockdown

Parameters	Week1	1st month	2nd month	3th month	p
DSST (number of boxes)	46.25±4.63	46.00±4.00	46.58±4.20	49.58±5.50	0.047
GA (arbitrary unit)	48.18±8.03	48.33±8.28	49.11±10.40	50.59±10.48	0.25
GM (arbitrary unit)	35.03±5.14	35.14±8.50	38.59±9.29	42.80±9.56	0.046

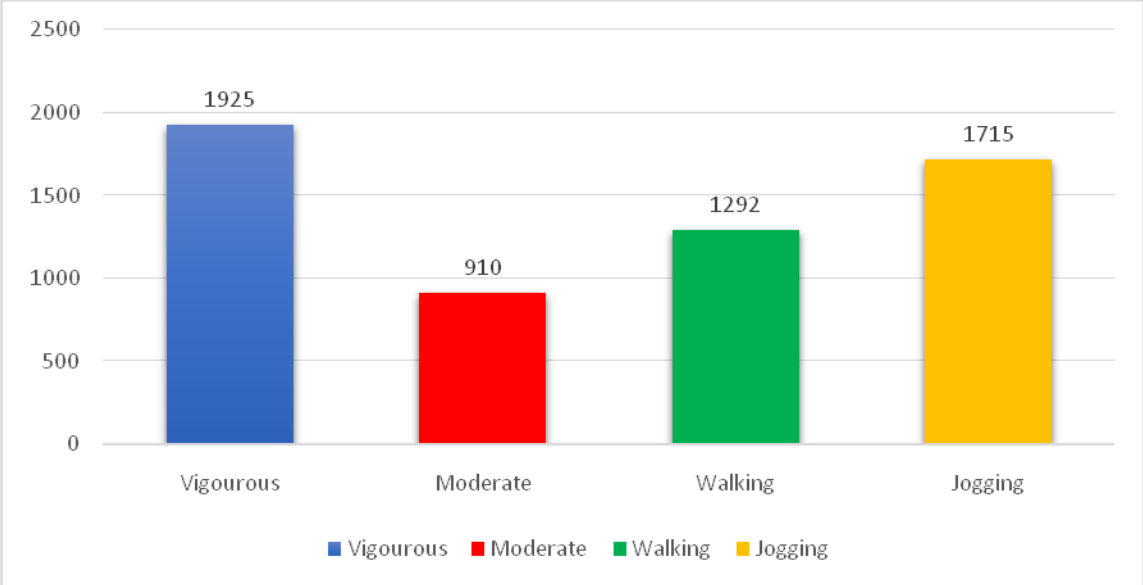
Abbreviations: DSST, Digit-Symbol Substitution Test; GA, general alertness; GM, general mood

Table.2 Analysis of correlation between physical fitness levels and psychophysiological data

	Objective vigilance	General vigilance	Moods
Vigorous PA	-0.073	-0.153	-0.201
Moderate PA	0.075	0.027	0.150
Walking	0.129	0.109	0.413

Abbreviation: PA, physical activity

Figure.1 Proportion of different types of physical activity declared by participants



The behavioral problems that affect people during the first month of COVID-19 lockdown suggest that the secretion of this hormone has a certain inertia, which needs to be taken into account when planning training sessions and sports competitions. For example, during Ramadan, a number of epidemiological studies (Laraqui *et al.,* 2001; Benchekroun *et al.,* 1999) and experimental studies (Buget, 1995; Gaillard, 1990; El-Khalifi, 1998) have shown that eating meals at night influences sleep quality, with difficulties in falling asleep, a reduction in sleep duration and waking up accompanied by alertness and increased daytime sleepiness.

Nevertheless, further studies are needed to determine whether sports training (individual and collective) in a very hot climate during COVID-19 lockdown had a disruptive effect on cognitive and psychomotor performance in university and top-level athletes.

Conclusion

Our findings showed a decrease in physical fitness, as well as deterioration in subjective and objective vigilance and mood states during COVID-19 lockdown. Hence the need to raise awareness of the impact of the COVID-19 pandemic on student behavior. This may help them to reflect on the changes they have observed, with a view to improving their lifestyle habits and well-being.

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How to cite this article:

Litoto Pambou Lucien. 2024. Impact of Covid-19 Lockdown on Physical Activity Level and Mental Health in Physical Education Students in Brazzaville, Congo. *Int.J.Curr.Res.Aca.Rev.* 12(11), 62-67.
doi: https://doi.org/10.20546/ijcrar.2024.1211.004