

The COVID-19 pandemic worsened the physical and mental health states of dancers in a Southern city in Brazil

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Abstract - Aim: The pandemic scenario and social isolation that it incurred has changed the population behavior in various segments. As an example, dancers have sought to perform and adapt to a virtual environment, but with possible physical and mental health consequences. The objective of this study was to analyze the impact of the COVID-19 pandemic on the variables, time and frequency of practice, in association with physical and mental health status, in dancers from Brazil. **Methods:** Ninety-one dancers participated in the study and were divided into two groups, according to their age group. Participants were evaluated using a semi-structured, self-reported questionnaire, administered in an online format. **Results:** There was a decrease in the time ($p < 0.05$) and frequency ($p < 0.001$) of participation in dance classes during the period, even though participants reported good virtual accessibility for class participation. Impacts on the physical and mental health of dancers were also observed, when compared to the period before the pandemic ($p < 0.001$). **Conclusion:** As such, it is concluded that the pandemic negatively influenced the physical and mental health of dancers and reduced the time and frequency of practice among them. Other studies are needed to further our understanding of the factors involved in this relationship between social isolation and the decrease in dance practice in dancers.

Keywords: SARS-CoV-2, ballet, dance, public health, quality of life.

Introduction

COVID-19 is a pathology caused by the SARS-CoV-2 virus family and is characterized as a severe acute respiratory syndrome. The first human cases of COVID-19 were detected in China in mid-December 2019¹. Due to the rapid advance of contamination, its severity and its high mortality rate, the World Health Organization characterized it as a global pandemic, and this brought about necessary measures for reducing contamination that were reflected in the behavior of society².

Emergency public health measures were adopted during the pandemic, such as the use of facemasks and alcohol, distancing and social isolation, with the intention of slowing down the transmission of the virus and preventing the collapse of health systems^{3,4}. Thus, like many Brazilian cities, the city of Ponta Grossa, located in the south of Brazil, decreed in March 2020 that non-essential services were suspended and only health, safety and food services considered essential

were maintained. As such, many activities of work, education, leisure and physical activity practices were transferred and readjusted to a virtual environment for a long period, including the activities of dance academies and schools. The effects of these changes on the health indicators of dancers during the pandemic period are still being distinguished.

According to Lourenço et al.⁵ and Oliveira et al.⁶, dance is considered an instrument that is capable of preventing and even positively interfering in the health and quality of life of the population, with regard to mental and social well-being, self-esteem, state of humor, physical conditioning and self-knowledge. In addition, the systematic practice of dance provides other benefits including improvements in physical abilities, motor skills, development of posture and body awareness, with variations in the intensity of physiological demands depending on gender/modality, as well as psychosocial benefits⁷ to physical and mental health⁸.

Dance as a service was considered non-essential in the pandemic, and adaptations were needed; academies and schools transferred dance practice to the virtual environment. These changes required effective readjustments by teachers and students to maintain the quality of dance classes, via video calls on specific apps, videos recorded and made available by messaging apps, lives on social networks, and/or organization of activities to be carried out at home, with different dimensions of follow-up⁹.

Studies that analyzed the population's need to adapt to the new behavioral habits caused by the pandemic have suggested losses in physical, immunological and mental health, as well as economic effects^{3,10-13}. However, the combination of the effects on the time and frequency of dance practice and its impact on the physical and mental health aspects of dancers is still unknown. The objective of this study was to analyze the effect of the COVID-19 pandemic on the variables: time and frequency of the practice of dance, and factors associated with the physical and mental health states, of dancers residing in a Brazilian city.

Methods

Study design

This descriptive study used a survey, quantitative-qualitative approach¹⁴ and was approved by an Ethics Committee in Research Involving Human Beings of the State University of Ponta Grossa, Brazil, under process no. CAAE 58931922.9.0000.0105. Sample recruitment was initially carried out by searching Google® Maps⁹, restricted to the city of Ponta Grossa/PR, Brazil, using the keywords "dance academies" and "dance schools"; only institutions that offered artistic dance modalities such as ballet, jazz, urban dance, contemporary dance, tap dance, ballroom dance, and folk dance were selected.

Sample

A total of 91 dancers participated in the study. Dancers were divided into two groups, according to age group, namely; Group I, participants under 18 years of age and Group II, dancers over 18 years of age.

Data collection

Contact was made with those responsible for the 21 dance academies / schools in the city and with all dancers, or their guardians, regularly enrolled during the pandemic period by phone or digital media. After accepting the invitation to participate in the study and signing the Free and Informed Consent Term (FICT)

and the Free and Informed Assent Term (FIAT), an access link to the questionnaires was made available for filling in between June 25th 2020, and July 2nd 2020, via Google® Forms. This tool is characterized as being easily accessible and visible, allowing only single completion, control of the order of the questions (with options) and a reduction in errors during the marking of answers^{15,16}.

The data collection instrument was a semi-structured self-administered questionnaire that was prepared by the authors, aimed at group I (dancers under the age of 18, where they should respond with the supervision of parents or guardians) and group II (dancers over 18 years of age), containing open, multiple-choice alternatives on a Likert-type scale and divided into four blocks: a) Characterization of the participants; b) accessibility/virtual communication; c) practice of other physical activities/exercises (not including dance practice) and sedentary behavior; d) physical and mental health states. Each block that made up the questionnaire is detailed below.

- a) Characterization of the participants: for the characterization of the participants, their age and self-reported gender, self-defined skin color and to the family income variable were considered.
- b) Accessibility/virtual communication: the evaluation of the quality of virtual access was obtained through the question "do you have access to the internet?", to which the participant answered using a scale of 4 levels of internet signal stability: ranging from presented a very good stability (stability 1) to very bad (stability 4).
- c) Practice of other physical activities/exercises (not including dance practice) and sedentary behavior: information regarding other physical exercise practices was obtained using the following questions: "Did you practice any other physical exercise besides dancing? If yes, which one? How many times a week?". This question was answered by the participant in essay form. Five other questions related to dance were asked:
 1. How long (months) have you been dancing?
 2. How often (number of times a week) do you practice?
 3. How long (hours/minutes) per week do you practice?
 4. How often (number of times a week) have you started to practice (in the pandemic)?
 5. How much time (hours/minutes) per week have you been practicing (during the pandemic)?
 Sedentary behavior was assessed using two questions: 1. Analyzing a week prior to the beginning of social isolation, please report how much time, on average per day, did you spend sitting/lying down (reading, watching TV, on the computer, on the internet, others)? 2. Analyzing a week during the period of social isolation, please report how much time, on average per day, did you spend sitting/lying down (reading, watching TV, on the computer, on the internet, others)?

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- d) Physical and mental health status: information on the profiles of the physical health states of respondents was collected using the following questions: "How do you describe your physical health state in the period before the pandemic?" and "How do you describe your physical health status during the pandemic?" to which the participants could respond: "very good", "good", "neither good nor bad", "bad" and "very bad". Similarly, the profile of mental health status was evaluated through the following questions: "How do you describe your mental health status in the period before the pandemic?" and "How do you describe your state of mental health during the pandemic? The following response options were available: "normal", "much better", "with some improvement", "approximately the same", "a little worse" and "much worse".

Statistical analysis

Initially, a descriptive analysis of the stratified data in both groups was performed. Mean values and standard deviations, as well as frequencies and confidence intervals, were used to characterize the sample. The *Kolmogorov-Smirnov* test was used to verify the normality of the data. To compare the mean values referring to the variables of practice and physical and mental health status of the participants, before and during the pandemic period, data that presented a non-parametric distribution were analyzed using the *Wilcoxon* test. For parametric data, *one-way ANOVA* was used. A confidence interval of 95% was considered and all analyzes were performed using *Graph-Pad Prism* Software, version 6.0.

Results

To define aspects of the impact of the COVID-19 pandemic in a Brazilian city, the socio-demographic variables of 91 individuals were analyzed and compared (Table 1). In Group I, we observed a prevalence of the age group between 7 and 10 years old (40%) and in Group II there was a prevalence of ages between 19 and 35 years (80%). With regard to gender, there was a predominance of 100% females in Group I and 78% females in Group II, with few males.

For the analysis of self-defined skin color, in both groups the predominance was white (88%) and individuals with black or brown skin represented 12% and 10%, respectively. With regard to the family income variable, the predominant income was in the range of R\$ 2.005,00 to R\$ 8.640,00 in both groups, indicating

Table 1 - Characteristics of dancer participants in the survey (n = 91). Ponta Grossa, Paraná, Brazil, 2020.

	Group I (n = 40)	Group II (n = 51)
Variables	N (%)	N (%)
Age (years)*		
03-06	3 (7%)	-
07-10	16 (40%)	-
11-14	11 (28%)	-
15-18	10 (25%)	-
19-35	-	41 (80%)
36-45	-	8 (16%)
46-60	-	2 (4%)
Gender		
Female	40 (100%)	40 (78%)
Male	-	11 (22%)
Other	-	-
Virtual accessibility		
No access	-	-
Cell phone data only	1 (2%)	-
Only Wi-Fi	5 (13%)	8 (16%)
Access to both Wi-Fi and cell phone data	34 (85%)	43 (84%)
Quality of virtual access		
Very good	11 (28%)	24 (47%)
Good	29 (72%)	26 (51%)
Bad	-	1 (2%)
Very bad	-	-

Note: * = Classification by age groups.

that participants belonged to the middle wage class C¹⁷.

Individuals with higher education and post-graduate education in both groups presented higher percentages for this variable; representing 60% in group I and 88% in group II; individuals with education up to elementary school level were observed only in group I.

With regard to virtual accessibility, all individuals had internet access, especially through Wi-Fi. Only one individual (Group I) reported having virtual access through cell phone data. Eighty-five percent and 84% of individuals in Groups I and II, respectively, had access to networks both through Wi-Fi and mobile data. Signal quality data showed that only one person in Group II reported having poor connection quality for virtual access.

When analyzing the data related to BMI and pathologies or symptoms (Table 2), we found that most participants had a BMI within normal health para-

Table 2 - Health parameter related to weight/height and prevalence of pathologies or symptoms of diseases in dancers (n = 91).

	Group I (n = 40)	Group II (n = 51)
Variables	N (%)	N (%)
BMI		
Underweight	1 (2%)	2 (4%)
Normal weight	27 (68%)	40 (78%)
Overweight	5 (12%)	8 (16%)
Obese	7 (18%)	1 (2%)
Pathologies/symptoms		
Do not have	29 (73%)	31 (61%)
Diabetes mellitus	2 (5%)	2 (4%)
High Cholesterol	1 (2%)	-
Hypertension	-	1 (2%)
Pulmonary dysfunctions *	2 (5%)	3 (6%)
Cardiovascular disease **	-	-
Frequent headache	6 (15%)	10 (19%)
Fibromyalgia	-	-
Others	-	4 (8%)

Note: * = Asthma, bronchitis, chronic obstructive pulmonary disease, etc. ** = Acute myocardial infarction, heart failure, arrhythmias, angina, etc.

meters, but 30% of the participants in Group I were classified as overweight or obese. This an alarming finding as this group is composed of dancers under the age of 18.

Regarding the prevalence of existing pathologies or symptoms, 73% of the individuals in Group I and 61% of the individuals in Group II described not having any type of pathology or symptoms of diseases. In both groups, the most prevalent symptoms were frequent headaches (15% in Group I and 19% in Group II), followed by pulmonary disorders, with 5% prevalence in group I and 6% in group II.

To define the impact of the COVID-19 pandemic on the behavioral profile, the variables of dance practice, other physical exercises and sedentary behavior before and during the pandemic period were analyzed and compared.

In Group I, we observed a reduction ($p = 0.002$) in the time dedicated to the weekly practice of dance during the pandemic, with a consequently greater sedentary behavior ($p = 0.001$) throughout the pandemic and without changes in practices of other types of physical exercises (Figure 1A). Regarding frequency, there was a decrease ($p = 0.001$) in the performance of weekly classes (Figure 1B).

For group II, during the pandemic, we observed reductions in both the time dedicated to the weekly practice of dance ($p \leq 0.05$) and other types of physi-

cal exercises ($p = 0.001$), with an increase ($p = 0.001$) in daily sedentary behavior, throughout the pandemic (Figure 2A). With regard to frequency, there was a decrease ($p = 0.001$) in the attendance of weekly classes (Figure 2B).

Parameters of physical health were significantly worse during the pandemic, when compared to the pre-pandemic period for both groups (Groups I and II, $p < 0.001$). In addition, the changes between the classifications occurred differently. Regarding physical health, we found a decreased prevalence (from 73% to 35%) in Group I and in Group II (from 53% to 20%) for the frequency of the “very good” category, in the behavioral profile of the physical health state during the pandemic (Figures 3-4 A). However, the classification “neither good nor bad” increased from 5% to 25% in Group I, and from 8% to 35% in Group II, indicating a reduction in positive states and an increase in negative states of physical health during the COVID-19 pandemic.

Likewise, the mental health results of both groups also showed significant reductions during the pandemic, when compared to the previous period (Group I, $p = 0.002$; Group II, $p < 0.001$). When analyzing the percentages of mental health status, a decline in positive states was observed, in association with an alarming increase in negative states, where the “normal” state before the pandemic presented frequencies of 73% and 50% in groups I and II, respectively, and was reduced to 40% (group I) and 14% (group II) during the pandemic (Figures 3-4 B). On the other hand, there was a worrying increase in the “a little worse” state, which presented a frequency of 2% (group I) and 4% (group II) before the pandemic and increased to 30% and 56% during the pandemic period, in groups I and II, respectively.

Discussion

For the analysis of the impact of the COVID-19 pandemic on the time and frequency variables of the practice of dance and factors associated with the physical and mental health states of dancers, we characterized the profiles of the dance practitioners in order to elucidate possible interferences in performing dance practice during the pandemic. With regard to the age groups of the dancers participating in the study, Group I presented a prevalence (40%) of dancers aged 7-10 years, suggesting difficulty in continuing dance practice during the pandemic period, due to the need for the presence of adults or guardians for the operation of equipment for the virtual practice of dance classes. This factor was not considered in group II, where 80% of dancers were aged between 19 and 35 years old.

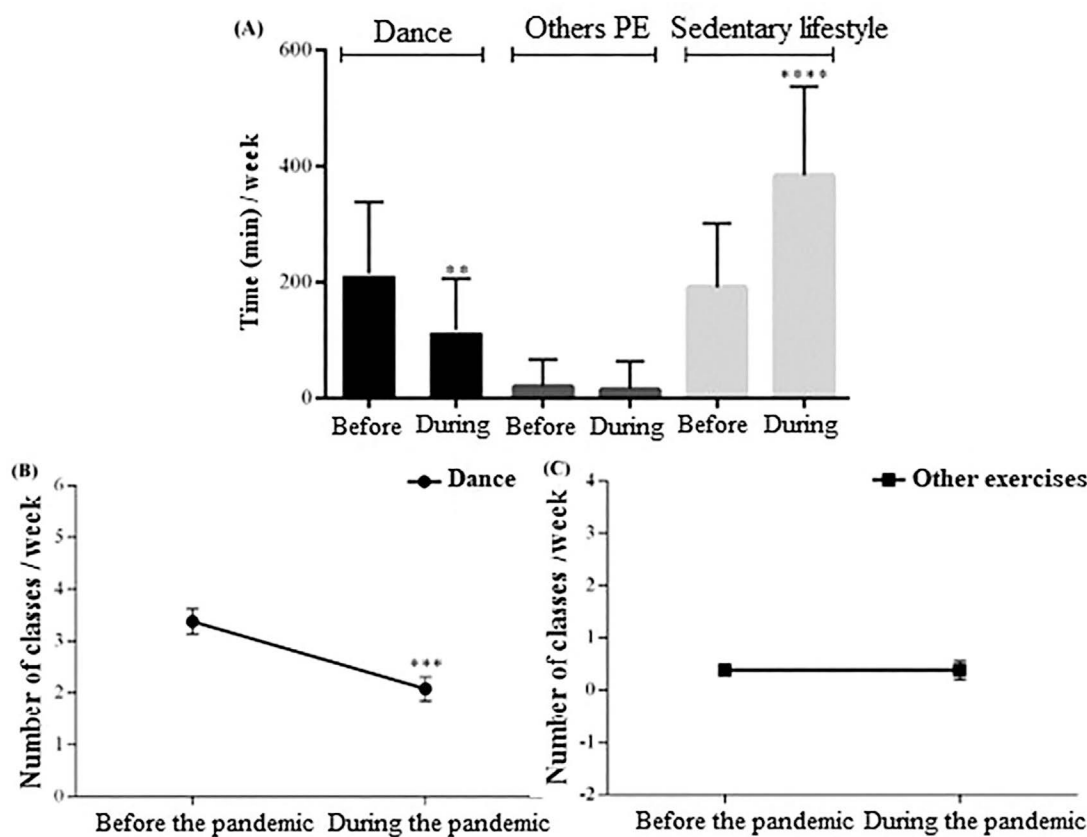


Figure 1 - Practice of dance exercise modality, practice of other types of physical exercises (PE) and sedentary behavior before and during the COVID-19 pandemic in group I dancers (n = 40). Ponta Grossa, Paraná, Brazil, 2020. Legend: (A): Values in mean $\pm$ standard deviation. One-way ANOVA statistical test. **p < 0.002 compared to before the pandemic (dance). ****p < 0.0001 compared to before the pandemic (sedentary lifestyle). (B-C): Weekly frequency, where each symbol represents the mean $\pm$ standard error of the mean. Unpaired t-student test. ***p < 0.0001 compared to before the pandemic (dance).

When analyzing data regarding virtual accessibility and the quality of virtual access, this study highlights that even with difficulties of greater or lesser quality during the video classes, all practitioners were able to access dance classes. Thus, we verified that the virtual access variable was not, in this study, a limiting factor for the continuity of dance practice. The analysis of BMI indicated a prevalence of healthy dancers in both groups, but overweight and obesity classifications were pronounced in Group I (30%). This finding is worrying, since obesity, even in children, is increasing every year. Obesity increases the risk for cardiovascular diseases such as hypertension, strokes, cardiac arrests, pulmonary diseases, diabetes mellitus type II and some types of cancer; these diseases are responsible for 2/3 of the world's deaths^{18,19}.

Good eating habits and regular practice of physical exercises have been recommended for combating obesity and its associated pathologies. According to Jardim e Souza¹⁸, the best way to combat obesity is at its starting point, that is, during childhood,

which is a better period for acquiring new habits for adulthood, as children with obesity are more likely to be obese adults^{18,20}. The COVID-19 pandemic caused changes in the format of dance classes that, added to the stress that was associated with the period, may have reflected on the adherence of the students to dance practice, as both groups demonstrated a decrease in the frequency and time of dance practice classes.

This decrease may be associated with the difficulties incurred by remote dance teaching, such as a lack of adequate physical space, difficulty in understanding movements and directions, incorrect timing of movements caused by the delay of the audio and video, lack of social interaction in person and the students' discouragement from taking classes at home. The pandemic caused losses in economic and financial conditions¹², which may have been related to the decrease in the frequency and weekly time of classes, since many students in both groups stopped taking classes during the pandemic.

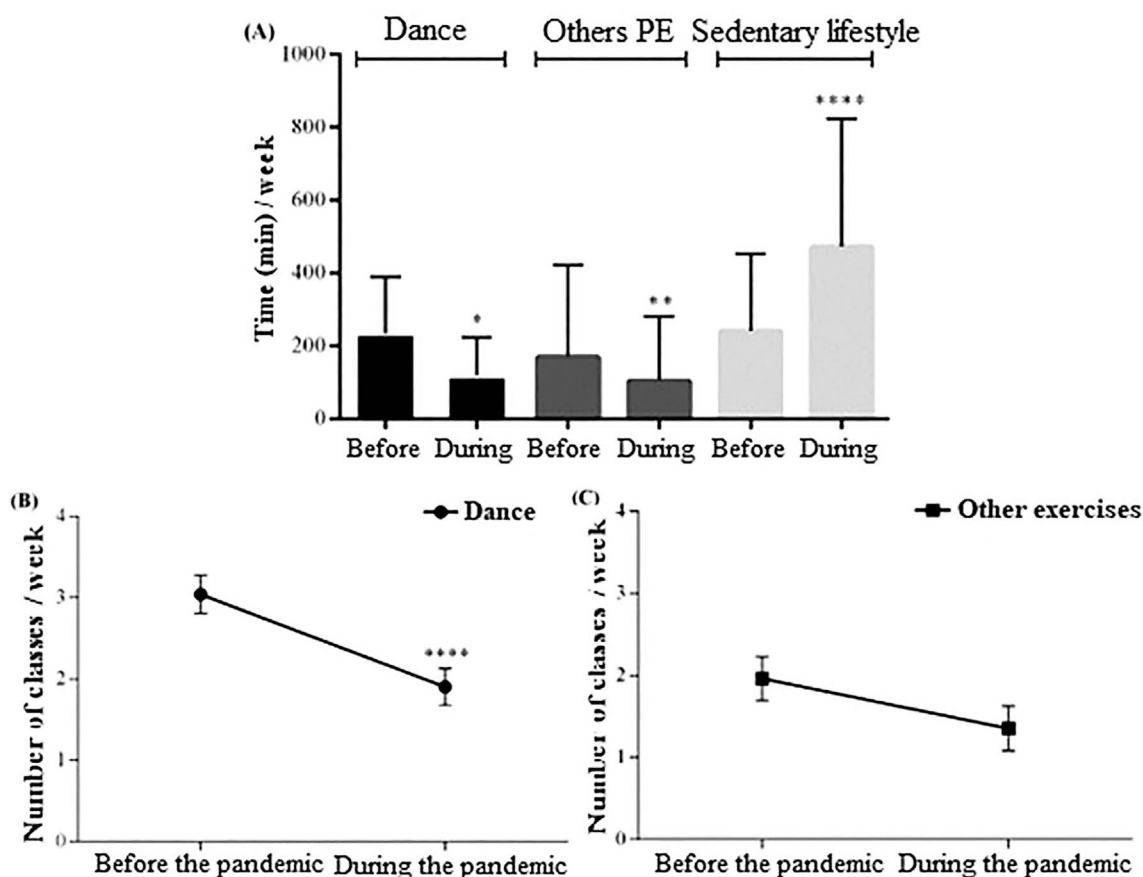


Figure 2 - Practice of dance exercise modality, practice of other types of physical exercises (PE) and sedentary behavior before and during the pandemic period of COVID-19, in dancers of group II (n = 51). Ponta Grossa, Paraná, Brazil, 2020. Legend: The asterisk "*" indicates that there was a significant difference. (A): mean values $\pm$ standard deviation. One-way ANOVA statistical test. * $p < 0.05$ compared to before the pandemic (dance). ** $p < 0.05$ compared to before the pandemic (other PE). **** $p < 0.0001$ compared to before the pandemic (sedentary lifestyle). (B-C): Weekly frequency, where each symbol represents the mean $\pm$ standard error of the mean. Unpaired t-student test. **** $p < 0.0001$ compared to before the pandemic (dance).

It should be taken into account that most dance practitioners are women and are usually responsible for household activities, in addition to childcare. Following the closure of in-person activities at daycare centers or schools, these women may have needed to continue to carry out work activities at home, generating an overload of domestic and work activities. Data regarding the physical and mental health profiles of participants showed a decrease in positive states and an increase in negative states during the pandemic, corroborating the findings of¹², as aspects related to the pandemic seem to have directly influenced physical and mental health.

This scenario, with so many uncertainties, contributed to the decline of mental health, facilitating the emergence of symptoms of anxiety and depression, post-traumatic stress, anguish, irritability, lack of attention, insomnia, feelings of helplessness and abandonment, justified by the fear of viruses and possible

economic and social crises^{13,21}. With regard to the practice of other exercises, data from group I indicated an increase in tiredness and fatigue, due to the fact that the individuals in this group were students and many remained full-time at school, culminating in only one activity in addition to the obligatory activity (which was dancing, in this case).

Data on dance practice and other exercises corroborate findings reported in the literature²²⁻²⁴ i.e., that the practice of exercises decreased during the pandemic period. Comparing sedentary behavior before and during the pandemic, there was a pronounced increase in sedentary lifestyle in both groups. This result may be associated with the transfer of activities to the virtual environment, and their performance at home, without locomotion to the gyms/schools, with reduced physical space or shared with the new routine of the house, and the increased time in front of the screen of a cell phone and/or computer.

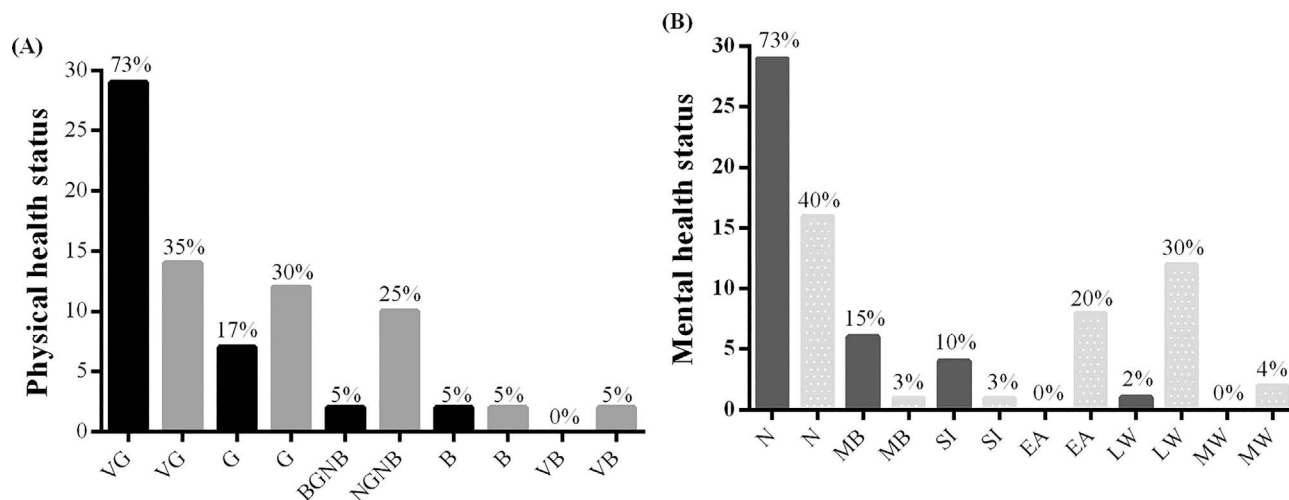


Figure 3 - Self-description of physical and mental health status, before and during the COVID-19 pandemic period, in group I dancers (n = 40). Ponta Grossa, Paraná, Brazil, 2020. Caption: (A): Physical health status of Group I ($p < 0.001$). Each bar represents the following variables: VG = very good; G = good; NGNB = neither good nor bad; B = bad; VB = very bad. (B): Results for Group I mental health status ($p = 0.002$). Each bar represents the following variables: N = normal; MB = much better; SI = with some improvements; AE = approximately equal; LW = a little worse; MW = much worse. Dark bars = before the pandemic. Light bars = during the pandemic.

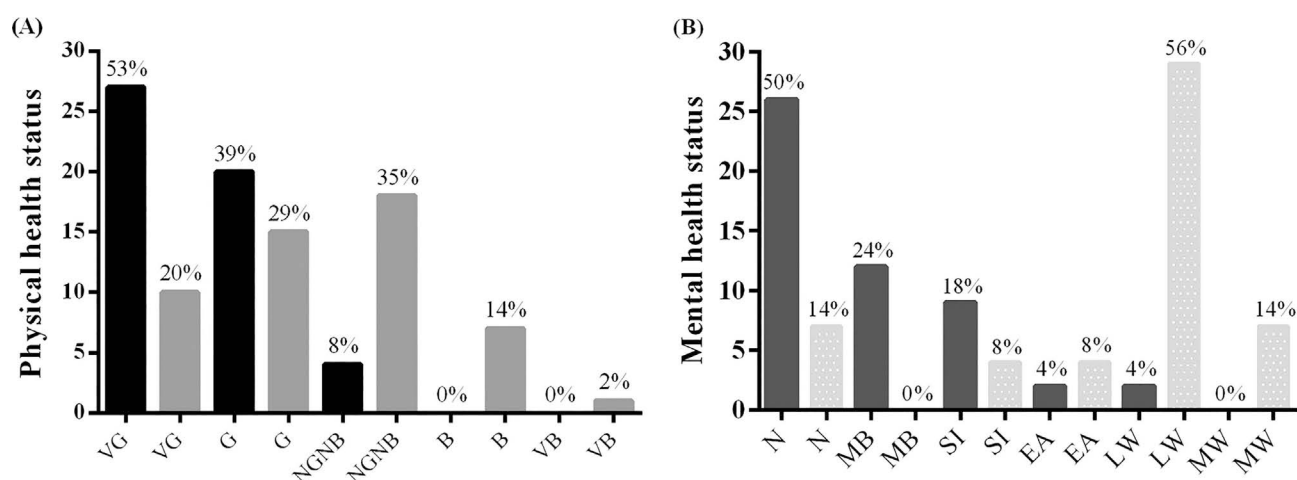


Figure 4 - Self-description of physical and mental health status, before and during the COVID-19 pandemic period, in group II dancers (n = 51). Ponta Grossa, Paraná, Brazil, 2020. Caption: (A): Physical health status of Group II ($p < 0.001$). Each bar represents the following variables: VG = very good; G = good; NGNB = neither good nor bad; B = bad; VB = very bad. (B): Results for Group II mental health status ($p = 0.002$). Each bar represents the following variables: N = normal; MB = much better; SI = with some improvements; AE = approximately equal; LW = a little worse; MW = much worse. Dark bars = before the pandemic. Light bars = during the pandemic.

The results found in the present study seem to be associated with new behaviors acquired during the period and the measures necessary to prevent the spread of the pandemic. The decline in dance class practice, together with the increase in sedentary behavior, may contribute to the fragility of the dancers' immune system, with possible installations of associated pathologies, increasing the individuals' risk for COVID-19 severity. Findings emphasize the importance of the regular practice of physical exercise and

dance to improve physical and mental health in practitioners.

Conclusions

It is concluded that the profile of dance practitioners, in the city of Ponta Grossa - PR, is white, middle-class females with a high level of education; the participants had good conditions for virtual access to dance classes, showing that this aspect was not an impediment to student participation. The COVID-19

pandemic had a negative impact on dance practice and on physical and mental health variables. These findings may be associated with the measures that were necessary to contain the spread of the SARS-CoV-2 virus, in addition to the reduction in the frequency and total weekly time of this activity in dance practitioners.

New studies are needed to relate the benefits of dancing to the symptomatology of pathological conditions and to compare with those individuals who do not dance, to determine the factors affecting the continuity of dance practice in the virtual environment and to investigate what really pushes practitioners away. Finally, studies should investigate, in more depth, the profile of dance practitioners in different regions of Brazil and verify the relationship between aspects related to the pandemic and mental health states.

It is expected that there will be greater attention given to this topic, with the generation of significant data related to health factors. This may lead to better conditions and contribute to the discovery of new interventions in virtual dance practice, serving as a basis for other studies in the areas of Physical Education and Dance.

AI use statement

No AI was used in this research.

Author contributions (CRediT)

Lucas Pinheiro do Prado: conceptualisation, investigation: methodology, data curation, writing - original draft, writing - review and editing, visualisation. **Felipe de Oliveira Mendonça:** conceptualisation, investigation: methodology, data curation, writing - original draft, writing - review and editing, visualisation. **Carla Adriane de Souza:** investigation: methodology, data curation, writing - review and editing, visualisation. **Marcelle Schoembaecler:** investigation: methodology, data curation, writing - review and editing, visualisation. **Luiza Herminia Gallo:** investigation: methodology, data curation, writing - review and editing, visualisation. **Silvia Regina Ribeiro:** conceptualisation, investigation: methodology, data curation, writing - original draft, writing - review and editing, visualisation.

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Data availability statement

The research data is available in the body of the document.

Conflict of interest statement

The authors have no conflicts of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report.

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