

PRELIMINARY DATA ON THE PROPHYLAXIS OF SEVERE FORMS OF COVID-19 THROUGH EXERCISE

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ABSTRACT. Independent studies suggest the possibility of prophylaxis of severe forms of COVID-19 through moderate-intensity exercise. There is the fear that intense exercise could increase the risk of the virus entering the cell, a determining factor being hypoxia. As a result, in this paper we aimed to assess the heart rate and oxygen saturation of the blood in the case of Kangoo Jumps and aerobic training at home. Kangoo Jumps workouts practiced in such a way as to avoid in principle the high intensity of the effort, do not produce transient hypoxia, not even in subjects whose heart rate indicated an intense effort. Preliminary data show that aerobics at home does not produce hypoxia in mature adults and the elderly, and heart rates do not exceed the limit of moderate intensity; however, additional studies are required for both categories of exercises under study.

Keywords: COVID-19, Kangoo Jumps, aerobics

REZUMAT. Date preliminare privind profilaxia formelor grave de covid-19 prin exerciții fizice. Studii independente sugerează posibilitatea profilaxiei formelor severe de COVID-19 prin exerciții de intensitate moderată. Există teama că exercițiile intense ar putea crește riscul pătrunderii virusului în celulă, un factor determinant fiind hipoxia. În consecință, în această lucrare ne-am propus să evaluăm frecvența cardiacă și saturația de oxigen a sângelui în cazul Kangoo Jumps și antrenamentului aerob la domiciliu. Antrenamentele Kangoo Jumps practicate în așa fel încât să evite în principiu intensitatea ridicată a efortului, nu produc hipoxie tranzitorie, nici măcar la subiecții a căror frecvență cardiacă a indicat un efort intens. Datele preliminare arată că aerobicul la domiciliu nu produce hipoxie la adulții maturi și vârstnici, iar ritmul cardiac nu depășește limita intensității moderate; cu toate acestea, sunt necesare studii suplimentare pentru ambele categorii de exerciții discutate în acest studiu.

Cuvinte cheie: COVID-19, Kangoo Jumps, aerobic

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INTRODUCTION

Medical hypothesis that moderate-intensity exercise can prevent severe forms of COVID-19 by stimulating mitochondrial biogenesis (Hagiu, 2020a) is partially confirmed by a study showing that people infected with SARS-CoV-2 but who are sufficiently physically active have a 34.3% lower risk of hospitalization (De Souza FR et al, 2020). However, that study did not differentiate between intense and moderate exertion. We consider that the percentage would be much higher if only individuals who had performed at least 150 minutes per week of moderate intensity effort were considered, because the intense effort, through the created hypoxia, could increase the expression of ACE2 receptors for the SARS-CoV-2 (Hagiu, 2020b).

OBJECTIVES

In view of the above, we aim to assess the heart rate (HR) (exercise intensity indicator) and the level of oxygen saturation in the blood (SpO₂) in the case of Kangoo Jumps practitioners (leisure sports activity especially appreciated by women, given the effect of lowering body weight – Beqa, Elezi & Elezi, 2019), as well as in the case of home aerobics practiced by the elderly, an activity considered to have low risks in this category (McPhee et al., 2016).

MATERIALS AND METHODS

The research was performed on a group of 7 women aged between 22 and 41 years, practicing Kagoo Jumps (Sports Club "Let's Move", Iasi, Romania), and, for the preliminary purpose of investigating the prophylaxis by exercise of severe forms of COVID-19, on a group of 6 subjects (4 women and 2 men) aged between 50 and 75 years, who attended a single aerobics session (moderate intensity) lasting 15 minutes. For Kangoo Jumps practitioners, the heart rate and the level of oxygen saturation in the blood were determined using the Breuer pulse oximeter before the start of the session, in the middle of it (after 30 minutes) and at the end (after 60 minutes). The determinations were repeated after 4 weeks, because during which time it was found that high-intensity training results in a chronic decrease in ACE2 plasma concentrations (acute increases occur only during and immediately after exercise sessions) (Klötting, Ristow & Blüher, 2020). In fact, in order to protect the study participants (who were already enrolled in that course at the time of volunteer recruitment), Kangoo Jumps programs were developed that would require less to moderate effort.

Thus, a lighter, dance-based program was applied, the upper and lower limbs were not required at the same time, the jumps were performed with medium amplitude, the jump/run ratio was 30%/70%, the tempo of the music was 135 bpm (beats/minute) compared to 138 bpm classical rhythm. It should be mentioned that all participants in the study had the status of beginners, the intensity of training gradually increasing based on learning to move. For the elderly subjects, the same determinations were performed with the pulse oximeter, before and after the 15-minute moderate-intensity aerobics session. In order to correlate the level of effort felt with that indicated by the increase in heart rate, the Borg test was also performed in elderly subjects. For all subjects, the maximum heart rate (HRmax) was calculated according to the formula 226 - age (years) for women, and 220 - age (years) for men. Then, for the HR determinations performed during and/or at the end, the respective percentage of HRmax was calculated as an indicator for the intensity of the effort.

RESULTS

The results are shown in Tables 1 and 2.

Table 1. Age, anthropological data (weight and height), HRmax, SpO₂ and HR measured before, 30 minutes after the start of the exercise session and at the end of the exercise session for Kangoo Jumps practitioners

No. crt.	Age (years)/ HRmax (beats/ min)	Weight (kg)/ height (cm)		SpO ₂ - 1	HR1 (beats / min)	SpO ₂ - 2	HR2 (beats / min) / P2	SpO ₂ - 3	HR3 (beats / min) / P3
1	36/ 191	75/ 170	IM	99	77	98	129/ 67%	98	108/ 56%
			FM	99	72	98	117/ 61%	93	127/ 66%
2	34/ 193	55/ 165	IM	99	74	99	153/ 79%	98	137/ 70%
			FM	99	74	96	153/ 79%	97	161/ 83%
3	41/ 185	67/ 163	IM	99	85	97	123/ 66%	97	121/ 65%
			FM	98	59	97	128/ 69%	97	147/ 79%
4	22/ 204	57/ 171	IM	92	91	98	117/ 57%	98	143/ 70%
			FM	98	93	97	138/ 67%	97	130/ 63%

No. crt.	Age (years)/ HRmax (beats/ min)	Weight (kg)/ height (cm)		SpO ₂ - 1	HR1 (beats / min)	SpO ₂ - 2	HR2 (beats / min) / P2	SpO ₂ - 3	HR3 (beats / min) / P3
5	25/ 201	70/ 170	IM	99	103	98	125/ 62%	98	145/ 72%
			FM	99	85	98	146/ 72%	98	165/ 82%
6	26/ 200	76/161	IM	98	95	97	173/ 86%	97	147/ 73%
			FM	99	120	97	160/ 80%	96	176/ 88%
7	28/ 198	66/ 173	IM	99	92	98	165/ 83%	99	174/ 87%
			FM	85	71	97	123/ 62%	99	133/ 67%

Note: IM - initial measurements; FM - final measurements (after 4 weeks); SpO₂ - 1 - blood oxygen saturation level at determination 1 (before training); SpO₂ - 2 - blood oxygen saturation level at determination 2 (after 30 minutes); SpO₂ - 3 - blood oxygen saturation level at determination 3 (after 60 minutes); HR1 - heart rate at determination 1 (before training); HR2 - heart rate at determination 2 (after 30 minutes); HR3 - heart rate at determination 3 (after 60 minutes); P2 - percentage of maximum heart rate at determination 2 (after 30 minutes); P3 - percentage of maximum heart rate at determination 3 (after 60 minutes)

Table 2. Age, anthropological data (weight and height), HRmax, Borg index, SpO₂ and heart rates measured before and after the moderate-intensity aerobic session

No crt	age (years) / gender / HR max (beats / min)	weight (kg) / height (cm)	Borg scale	SpO ₂ - 1	HR1 (beats / min)	SpO ₂ - 2	HR2 (beats / min) / P
1	69/F/157	74/166	9	96	77	95	84/53%
2	50/F/176	85/168	9	96	63	98	80/45%
3	55/F/171	60/165	10	97	70	95	90/52%
4	74/F/152	77.164	14- 15	97	70	95	75/49%
5	75/M/145	76/177	12- 13	98	65	95	70/48%
6	72/M/148	75/165	7	93	65	92	65/43%

Note: M - male gender; F- feminine; HRmax - maximum heart rate; SpO₂ - 1 - blood oxygen saturation level at determination 1; SpO₂ - 2 - blood oxygen saturation level at determination 2 (after 15 minutes); HR1 - heart rate at determination 1; HR2 - heart rate at determination 2 (after 15 minutes); P2 - percentage of maximum heart rate at determination 2 (after 15 minutes)

DISCUSSIONS

The analysis of the results shows that for Kangoo Jumps practitioners SpO₂ never dropped below 92 during the exercise sessions, which means that the lactic threshold was not exceeded (Ozcelik & Kelestimur, 2004). Moreover, the absence of deoxygenation leads us to believe that there was no overexpression of ACE2, and thus an increased risk of SARS-CoV-2 infection. Maintaining normal blood oxygenation in conditions of increased heart rate above the limit that characterizes moderate exercise (70% of HRmax) can be explained by the cardiovascular effects of plyometric training (post-exercise hypotension, probably caused by vasodilation) (Arazi et al, 2014). Except for subjects 6 and 7, the heart rate limit that characterizes vigorous exercise intensity (85% of HRmax) was not exceeded. Due to the small number of subjects we did not calculate and compare the average values of heart rates, but it seems that 4 weeks of training were not enough to improve aerobic capacity. Preliminary data indicate an encouraging fact, namely that moderate Kangoo Jumps training does not lead to hypoxia and implicitly the stimulation of ACE2 expression, and can be included in the category of physical activities with a prophylactic role of severe forms of COVID-19. However, further studies are needed, as it appears that intense exercise is contraindicated in this prophylaxis not only due to deoxygenation and the immune disorders they cause, but also through multiple metabolic changes (Hagiu, 202, Da Silveira et al, 2021). In the case of subjects who performed moderate intensity aerobics, the values of heart rates recorded at the end of the session did not exceed the limit for moderate exercise intensity (70% of HRmax). Deoxygenation did not occur in any of the subjects. The Borg scale shows a more intense appreciation of effort in older subjects (4 and 5). It follows that individualized aerobic programs must be implemented in those individuals, and the monitoring of the effort must be done continuously.

CONCLUSIONS

1. Kangoo Jumps trainings performed in such a way as to avoid high intensity exercise in principle, although falling within vigorous exercise intensity, do not produce transient hypoxia suspected of inducing overexpression of ACE2 receptors (to which SARS-CoV-2 binds). This proved to be true even in subjects whose heart rate indicated intense exertion, probably due to metaboreflexes triggered by plyometrics.

2. Preliminary data indicate that home aerobics is well tolerated by mature and elderly adults. However, at older ages, adapted, individualized programs as well as continuous supervision are needed.

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