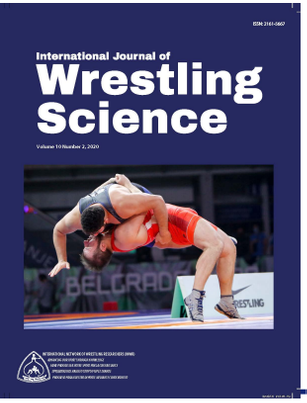

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THE IMPACT OF INDOOR TRAINING PROGRAM DUE TO COVID-19 QUARANTINE, ON SOME PHYSIOLOGICAL, PHYSICAL, AND TECHNICAL VARIABLES IN ELITE WRESTLERS

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ABSTRACT
Egypt's COVID-19 co-existence plan insisted on social distancing and the closure of physical and sport entities. WHO illustrated the importance of training at home with at least 150 minutes of moderate load exercises or 75 minutes of high load exercises in order to reduce the indoor related health problems such as; anxiety, stress, and immunity deficiency. This study aimed to investigate the Impact of Indoor Training Program Due to COVID-19 quarantine, on some Physiological, Physical, and Technical Variables in Elite Wrestlers. 8 professional wrestlers with an average age of 19.3 years, agreed to participate in a 12 week of indoor training regimen. Long period change in training regime with short bouts of resistive physical and technical exercises affected the back flexibility and physiological variables with a reduction in maximal oxygen consumption "VO_2max", breathing frequency "BF", ratio between carbon dioxide and oxygen "RER", and little change in caloric expenditure. Performance efficiency decreased especially in performance endurance measured in time and score, in correlation with the physiological variables.
Keywords: indoor training, wrestling, efficiency, COVID-19.

INTRODUCTION

The COVID-19 pandemic changed the face of the world. Since the corona virus had spread nearly all over the world, restricted instruction came out of health ministries and agencies in order to stop the spread of the virus. All aspects of human life was affected with restrictions including; social activities, physical activities and sports, these restrictions resulted closure of sport facilities like sporting clubs, gyms, fitness centers and rehab centers (Daniela et al., 2020). Egypt's COVID-19 co-existence plan also insisted on social distancing and keeping closure of physical and sport entities (State information service, 2020). Stay home was the first goal of all governorates all over the world so, WHO and health monitors began to advocate plans for mitigation of detraining effects on human health and immunity which was badly needed for reducing the probability of infection.

WHO illustrated the importance of training at home with at least 150 minutes of moderate load exercises or 75 minutes of high load exercises in order to reduce the indoor related health problems such as; anxiety, stress, immunity deficiency and even fear of loss of family and beloved ones (Daniela et al., 2020). Amateurs and professional athletes were the highly affected by stay home restriction, so tele-training, self-training and online personal trainers were and still are in action.

Detraining was the main concern for trainers where interrupting training has a passive effect on athletes' physiological and physical adaptation that can also lead to abnormality in eating, sleeping and psychological status (Mujika, and Padilla, 2000; Chen, et al., 2020; Joo, 2018). This was the opportunity for the researchers to carry out this study to identify the capability of tele-training based on interactive training program on elite wrestlers' physiological and physical parameters.

METHODS

In this experimental study pretests were taken during a period of preparation for the Egyptian universities' championship in March just before university shuts down and closure of all sport facilities. Researchers took the opportunity to test the capability of tele-interactive indoor training program in maintaining the athletes' physiological and physical parameters.

Participants: 8 healthy, professional wrestlers with average age 19.3 years, agreed to participate "with written consent" in this study, wrestlers are members of the Egyptian wrestling federation. Table 1, describes the variables of the study sample.

Table 1, Statistical norms of the study sample in all the study variables

Main variables	unit	Mean	Median	SD	skew
Growth variables					
Age	year	19.375	19.500	1.408	-0.564
Height	cm	170.250	170.500	3.615	-1.255
Weight	kg	75.500	76.000	3.381	-0.796
Training experience	year	8.250	8.000	1.282	-1.546
Physiological variables					
Vo2max	h	47.194	42.415	1.403	2.234
BF	L/min	53.000	54.000	3.703	-0.722
RER	L/min	1.659	1.815	0.366	-1.309
Calories	kcal	94.973	96.730	5.450	0.036
Physical variables					
Handgrip "right"	kg	35.250	35.000	2.053	0.142
Handgrip "left"	kg	29.125	29.000	1.808	-0.930
Back muscle strength	kg	79.625	79.500	3.292	0.700
Back muscle flexibility "bridge"	cm	26.000	26.000	3.071	-0.804
Technical variables					
Performance efficiency "score"	score	20.500	20.000	1.069	-0.831
Performance efficiency "speed"	sec	6.875	7.000	0.641	0.741

Table 1, represents the mean, median, standard deviation "SD"

Procedure

Study tests were based on pretest before closure; tests were physiological parameters with ergospirometry. VO_2max (maximum oxygen uptake) recorded in ml/kg/min, BF (breathing frequency) in number, RER (ratio between exhaled carbon dioxide and inhaled oxygen) in ratio, and calories expended in the overall test. Physical tests were handgrip strength (hand dynamometry), back muscles strength (dynamometry) and back flexibility (with bridge test) in centimeters. Efficiency of performance (score- time) was the technical tests where athletes perform 3 times bridge and throw where the shorter time scored, the more efficiency in performing as a performing speed. The other performance test utilized multiple suplexes achieved during a specified time, the more suplexses recorded the more efficiency in performance. These performance tests were carried out to investigate the influence of indoor training on the technical capability of the wrestlers.

Wrestlers experienced tele-interactive training program, consisted of 3 sessions/ week and lasted up to 12 week of indoor training tell the gradual reopening of sport facilities in June. Training program was alike the traditional training program of the wrestlers, but the challenge for this study were the equipment, adequate wrestling mats, open area for full range of motion during performance, face to face wrestling mates and proper recovery. Training program carried out by coaching over zoom cloud meeting app, as its easy and common in use between youth, Table 2, represents the training program.

Table 2, the indoor training program

Week	Session content	Unite Duration	Exercise, (wrestling drills)	Intensity	Rept.	Group	Tools
1 - 4	Warm up	5min.	March in place Muscle stretching	40-50%	1	1	
	Main part (wrestling drills)	15min.	arm control "left-right" (cling)	60-75%	15	3	Elastic band-pull rally rope-dumbbell-sand bags
			palm, wrist Grip				
			Snatch drill upright position (obstacle resistance)				
			Snatch drill upright position (light resistance)				
	Closure part	5min.	Cool down-Stretch	30%	1	1	
5 - 8	Warm up	5min.	Jogging Muscle stretching	40-50%	1	1	
	Main part (wrestling drills)	15min.	arm control (cling)	60-75%	15	3	dumbbells 10k-pull rally rope-kettlebells
			Balance, palm Grip				
			Snatch drill upright position				
			Snatch drill upright position (heavy resistance)				
			Snatch drill upright position (heavy resistance)				
			Snatch drill down position (heavy resistance)				
			Snatch drill down position (heavy resistance)				
			Snatch drill down position (heavy resistance)				
			down position (wrenching against obstacle)				
	Closure part	5min.	Jogging	30%	1	1	
9 - 12	Warm up	5min.	Jogging Muscle stretching	40-50%	1	1	
	Main part (wrestling drills)	15min.	Rope fixed in shoulder level upper hence "right, left" rope fixed in waist level (back bent "bridge") rope fixed in feet level lower hence "right, left" squat raise then back through "right, left"	75-85%	15	3	dumbbells 10k-pull rally rope-kettlebells
	Closure part	5min.	Jogging	30%	1	1	

Statistical analysis: Statistical analyses were performed using SPSS software, M "means", SD "standard deviation", T-test and Changing percentage were used for treating the collected data of study tests.

RESULTS

Analytic treatment of the study data resulted the following results, tables 3, 4, represent the study results.

Table 3, t-test and changing percentage of the physiological variables of the study

Physiological variables	Pre-test		Post-test		Mean def.	error	t-test	Changing percentage
	M	±SD	M	±SD				
Vo2max	47.194	1.403	43.489	1.637	3.705	0.841	4.404	8.781
BF	53.000	3.703	49.750	3.412	3.250	1.032	3.149	6.132
RER	1.659	0.366	1.714	0.378	0.055	0.120	0.459	3.316
Calories	94.973	5.450	96.347	5.884	1.374	2.978	0.461	1.446

T value at significance of 0.05=1.895

Table 3, represents significant differences between pre and post-test in vo2max and BF variables, but no significant differences found between pre and post-tests of RER and calorie expended in overall test, were calculated t value was between (0.461:4.404).

Table 4, t-test and changing percentage of the physical and technical variables of the study

Physical and Technical variables	Pre-test		Post-test		Mean def.	error	t-test M	Changing percentage ±SD
	M	±SD	M	±SD				
Physical variables								
Handgrip "right"	35.250	2.053	35.975	2.031	0.725	0.310	2.339	2.057
Handgrip "left"	29.125	1.808	30.125	1.959	1.000	0.378	2.646	3.433
Back muscle strength	79.625	3.292	81.450	3.855	1.825	0.263	6.938	2.292
Back muscle flexibility "bridge"	26.000	3.071	31.375	3.420	5.375	0.460	11.672	20.673
Technical variables								
Performance efficiency"score"	20.500	1.069	13.375	0.916	7.125	0.998	7.139	34.756
Performance efficiency"speed"	6.875	0.641	8.000	0.756	1.125	0.125	9.000	16.364

T value at significance of 0.05=1.895

Table 4, represents significant differences between pre and post-test in all physical and technical test, were calculated t value was between (2.339:13.840).

DISCUSSION

Indoor training was a challenging experience for keeping athletes in action. Lack of space, partnership cooperation and sport equipment were the first challenges to both athletes and trainers. To investigate the impact of indoor training on athletes' status the researcher chose physiological, physical and technical variables, as representors of athletes' overall well-being. Wrestling is a high intensity sport with short interval of performance where wrestlers always attempt to maximize their muscle size and power (Yoon, 2002), although wrestling is characterized with anaerobic system, many studies used VO_2max as a detector of wrestlers status (Arslanoğlu, 2015; Ramirez-Velez, et al., 2014). VO_2max is considered one of the common indicators of evaluating aerobic capacity and body energy system. VO_2max reflects a player's overall fitness level, it is also known as aerobic and oxidative capacity, where it represents the maximum oxygen consumption used during building ATP (Hadžović-Džuvo, et al., 2014). VO_2max is characterized by the limits of ones oxygen transport system, and because its value does not vary from moment to moment, it gives a true indication of the athletes aerobic capacity (Scribbans, et al., 2016; Dlugosz, et al., 2013).

Physiological variables taken by through an ergometer cardiopulmonary testing showed significant difference in VO_2max reading, The recent study recorded mean of 47.194 mL/kg/min in the pre-test showing moderate status of the study sample. Reported values of international level wrestlers' are 45.9 ± 6.6 mL/kg/min for Colombian wrestlers, (Ramirez-Velez, et al., 2014), 49 mL/kg/min for Turkish wrestlers (Arslanoğlu, 2015), and 59.8 mL/kg/min for Polish wrestlers (Hübner-Woźniak, et al., 2009). Post-test of VO_2max recorded decreased mean with 43.489 mL/kg/min in wrestlers reading after indoor training showing the decrease of aerobic capacity with 2.057%, that can be attributed to less of working area, lack of performance endurance where there is no colleague or opponent to challenge, the attitude of the training program which depended on small resistance with short time endurance, but as a physiological detector, the post reading is still in the frame of high trained athletes reading according to the relative studies (Heywood, 2006).

BF (breathing frequency) is the number of breaths per minutes. Adaptive breathing frequency is decreased in trained athletes at rest with 7-8 breaths/minute, where it ranges about 12-20 breaths/minute in untrained individual. This reduction in breathing frequency represents greater respiration efficiency which attributed to adequate training or physical exercises (Gulam, 2016), unlike the measured BF during exercise where breathing frequency rises related to the high efficiency of athletes' respiration (Nicolò, et al., 2017). Recent reading of BF showed a little reduction with 6.132%, related to VO_2max reduction showing minor retreat of respiration efficiency caused by the less endurance enclosed in the indoor training program.

RER is the ratio between the amount of exerted carbon dioxide (CO2) exhaled and the inhaled oxygen (O2) showing the energy expenditure during the performance (Ramos-Jiménez, et al., 2008). RER is related to the high training intensity that could determine the anaerobic threshold of the athletes (Bellar, and Judge, 2012), matching the wrestling energy regime. RER value is considered a proper indicator of overall physical fitness (Bearden, et al., 2004). Recent RER reading recorded insignificant increase with 3.316% for the post-test where related studies emphasized unchanging values of RER in case of changing the training intensity (Houmard, et al., 1992), RER reduction signaling a drop in aerobic metabolism in of carbohydrate consumption matching the results of related studies (Bellar, and Judge, 2012; Rietjens, 2001), recent reading also related to decrease in

VO_2max and BF collected from post-test of the sample wrestlers showing the physiological changes in anaerobic capacity and fatigue threshold.

Insignificant increase in calories expended in the post-test with 1.446%, reflecting the change in energy expenditure and fast fatigue threshold of the wrestlers after the reduction of the training bout "indoor training" matching the results of related studies (Madsen, 1993; Mujika, and Padilla, 2001).

The training program in this study cared avoiding the detraining condition that may result out of "stay home" restriction, although the detraining influence the athletes after a long period of cutting the training off (Mujika, and Padilla, 2001), but studies pointed that a less amount of training may help in reducing the impact of detraining effect (MacDougall, and Sale, n.d.), that was the priority of this study. The researcher tried to preserve the physical and technical capabilities as well, so the training program depended on short bouts of specific physical exercises, the physical pre/post-tests of the wrestlers were significantly changed as little increase with 2.057% and 3.433%, in muscular strength represented in hand grip test for right and left handgrip respectively, where hand grip strength is considered a detector of overall body strength and successful wrestling performance (García-Pallarés, et al., 2011; Iermakov, et al., 2016), the recorded increased in right and left hand grip test is due to the focus of the training program on single joint action strength exercises as it's a successful method of increasing the overall body strength (Gentil, et al., 2015), and because of the ease of its performance and the less equipment needed, that was convenient with home training. Back muscle strength test as well is considered a successful method of testing wrestlers strength capability (Guilhem, et al., 2014), where relative studies emphasized on its crucial impact in wrestling performance (García-Pallarés, et al., 2011; Kraemer, et al., 2001), recent study resulted significant increase in back muscle reading in post-test with 2.292%, which also directs the influence of single joint muscle strengthening in wrestlers as performed in the study program matching the related study which showed the slow effect of reducing the exercising bouts on isometric strength of back muscles (de França, et al., 2015; Tucci, et al., 1992). On the contrary, back mobility test recorded significant reduction with 20.673% as the single joint resistance exercise resulted in a strong but stiff body in contrast with resistive wide range of motion resulted in technical performance with actual opponent weight, then the applied exercises of single joint increased the muscles strength but lowered the mobility of back muscle which in compatible with related studies (Basar, et al., 2014; Chaabene, et al., 2017) unlike the findings of other related studies which demonstrated a little increase in back flexibility out of muscle strengthening only (Leite, et al., 2017; Saraiva, et al., 2014). Technical variables recorded significant reduction with 34.756% for performance efficiency in score, and 16.364% for performance efficiency in time, which represent the performance endurance. This reduction was related to previous decrease in physiological and physical variables indicating the integrating adaptation of athlete's body (Swärd, 1990).

CONCLUSIONS

Wrestling performance was influenced by the change in training regime due to "stay home" COVID-19 restrictions. Although athletes maintained their muscular strength, but the long period of change in training regime, with short bouts of resistive physical and technical exercises affected the back flexibility and physiological variables with reduction in VO_2max, BF, RER, and little change in calorie expenditure. Performance efficiency decreased, especially in performance endurance measured in time and score, in correlation with the physiological variables. Indoor training succeeded in ceasing the influence of detraining, but wasn't sufficient enough to simulate real performing with opponent resistance.

Conflict of interest: the authors declare that this study is self-funded, and there is no conflict of interest.

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Keywords: indoor training, wrestling, efficiency, COVID-19.

INTRODUCTION

The COVID-19 pandemic changed the face of the world. Since the corona virus had spread nearly all over the world, restricted instruction came out of health ministries and agencies in order to stop the spread of the virus. All aspects of human life was affected with restrictions including; social activities, physical activities and sports, these restrictions resulted closure of sport facilities like sporting clubs, gyms, fitness centers and rehab centers (Daniela et al., 2020). Egypt's COVID-19 co-existence plan also insisted on social distancing and keeping closure of physical and sport entities (State information service, 2020). Stay home was the first goal of all governorates all over the world so, WHO and health monitors began to advocate plans for mitigation of detraining effects on human health and immunity which was badly needed for reducing the probability of infection.

WHO illustrated the importance of training at home with at least 150 minutes of moderate load exercises or 75 minutes of high load exercises in order to reduce the indoor related health problems such as; anxiety, stress, immunity deficiency and even fear of loss of family and beloved ones (Daniela et al., 2020). Amateurs and professional athletes were the highly affected by stay home restriction, so tele-training, self-training and online personal trainers were and still are in action.

Detraining was the main concern for trainers where interrupting training has a passive effect on athletes' physiological and physical adaptation that can also lead to abnormality in eating, sleeping and psychological status (Mujika, and Padilla, 2000; Chen, et al., 2020; Joo, 2018). This was the opportunity for the researchers to carry out this study to identify the capability of tele-training based on interactive training program on elite wrestlers' physiological and physical parameters.

METHODS

In this experimental study pretests were taken during a period of preparation for the Egyptian universities' championship in March just before university shuts down and closure of all sport facilities. Researchers took the opportunity to test the capability of tele-interactive indoor training program in maintaining the athletes' physiological and physical parameters.

Participants: 8 healthy, professional wrestlers with average age 19.3 years, agreed to participate "with written consent" in this study, wrestlers are members of the Egyptian wrestling federation. Table 1, describes the variables of the study sample.

Table 1, Statistical norms of the study sample in all the study variables

Main variables	unit	Mean	Median	SD	skew
Growth variables					
Age	year	19.375	19.500	1.408	-0.564
Height	cm	170.250	170.500	3.615	-1.255
Weight	kg	75.500	76.000	3.381	-0.796
Training experience	year	8.250	8.000	1.282	-1.546
Physiological variables					
Vo2max	h	47.194	42.415	1.403	2.234
BF	L/min	53.000	54.000	3.703	-0.722
RER	L/min	1.659	1.815	0.366	-1.309
Calories	kcal	94.973	96.730	5.450	0.036
Physical variables					
Handgrip "right"	kg	35.250	35.000	2.053	0.142
Handgrip "left"	kg	29.125	29.000	1.808	-0.930
Back muscle strength	kg	79.625	79.500	3.292	0.700
Back muscle flexibility "bridge"	cm	26.000	26.000	3.071	-0.804
Technical variables					
Performance efficiency "score"	score	20.500	20.000	1.069	-0.831
Performance efficiency "speed"	sec	6.875	7.000	0.641	0.741

Table 1, represents the mean, median, standard deviation "SD"

Procedure

Study tests were based on pretest before closure; tests were physiological parameters with ergospirometry. VO_2max (maximum oxygen uptake) recorded in ml/kg/min, BF (breathing frequency) in number, RER (ratio between exhaled carbon dioxide and inhaled oxygen) in ratio, and calories expended in the overall test. Physical tests were handgrip strength (hand dynamometry), back muscles strength (dynamometry) and back flexibility (with bridge test) in centimeters. Efficiency of performance (score- time) was the technical tests where athletes perform 3 times bridge and throw where the shorter time scored, the more efficiency in performing as a performing speed. The other performance test utilized multiple suplexes achieved during a specified time, the more suplexses recorded the more efficiency in performance. These performance tests were carried out to investigate the influence of indoor training on the technical capability of the wrestlers.

Wrestlers experienced tele-interactive training program, consisted of 3 sessions/ week and lasted up to 12 week of indoor training tell the gradual reopening of sport facilities in June. Training program was alike the traditional training program of the wrestlers, but the challenge for this study were the equipment, adequate wrestling mats, open area for full range of motion during performance, face to face wrestling mates and proper recovery. Training program carried out by coaching over zoom cloud meeting app, as its easy and common in use between youth, Table 2, represents the training program.

Table 2, the indoor training program

Week	Session content	Unite Duration	Exercise, (wrestling drills)	Intensity	Rept.	Group	Tools
1 - 4	Warm up	5min.	March in place Muscle stretching	40-50%	1	1	
	Main part (wrestling drills)	15min.	arm control "left-right" (cling)	60-75%	15	3	Elastic band-pull rally rope-dumbbell-sand bags
			palm, wrist Grip				
			Snatch drill upright position (obstacle resistance)				
			Snatch drill upright position (light resistance)				
	Closure part	5min.	Cool down-Stretch	30%	1	1	
5 - 8	Warm up	5min.	Jogging Muscle stretching	40-50%	1	1	
	Main part (wrestling drills)	15min.	arm control (cling)	60-75%	15	3	dumbbells 10k-pull rally rope-kettlebells
			Balance, palm Grip				
			Snatch drill upright position				
			Snatch drill upright position (heavy resistance)				
			Snatch drill upright position (heavy resistance)				
			Snatch drill down position (heavy resistance)				
			Snatch drill down position (heavy resistance)				
			Snatch drill down position (heavy resistance)				
			down position (wrenching against obstacle)				
	Closure part	5min.	Jogging	30%	1	1	
9 - 12	Warm up	5min.	Jogging Muscle stretching	40-50%	1	1	
	Main part (wrestling drills)	15min.	Rope fixed in shoulder level upper hence "right, left" rope fixed in waist level (back bent "bridge") rope fixed in feet level lower hence "right, left" squat raise then back through "right, left"	75-85%	15	3	dumbbells 10k-pull rally rope-kettlebells
	Closure part	5min.	Jogging	30%	1	1	

Statistical analysis: Statistical analyses were performed using SPSS software, M "means", SD "standard deviation", T-test and Changing percentage were used for treating the collected data of study tests.

RESULTS

Analytic treatment of the study data resulted the following results, tables 3, 4, represent the study results.

Table 3, t-test and changing percentage of the physiological variables of the study

Physiological variables	Pre-test		Post-test		Mean def.	error	t-test	Changing percentage
	M	±SD	M	±SD				
Vo2max	47.194	1.403	43.489	1.637	3.705	0.841	4.404	8.781
BF	53.000	3.703	49.750	3.412	3.250	1.032	3.149	6.132
RER	1.659	0.366	1.714	0.378	0.055	0.120	0.459	3.316
Calories	94.973	5.450	96.347	5.884	1.374	2.978	0.461	1.446

T value at significance of 0.05=1.895

Table 3, represents significant differences between pre and post-test in vo2max and BF variables, but no significant differences found between pre and post-tests of RER and calorie expended in overall test, were calculated t value was between (0.461:4.404).

Table 4, t-test and changing percentage of the physical and technical variables of the study

Physical and Technical variables	Pre-test		Post-test		Mean def.	error	t-test M	Changing percentage ±SD
	M	±SD	M	±SD				
Physical variables								
Handgrip "right"	35.250	2.053	35.975	2.031	0.725	0.310	2.339	2.057
Handgrip "left"	29.125	1.808	30.125	1.959	1.000	0.378	2.646	3.433
Back muscle strength	79.625	3.292	81.450	3.855	1.825	0.263	6.938	2.292
Back muscle flexibility "bridge"	26.000	3.071	31.375	3.420	5.375	0.460	11.672	20.673
Technical variables								
Performance efficiency"score"	20.500	1.069	13.375	0.916	7.125	0.998	7.139	34.756
Performance efficiency"speed"	6.875	0.641	8.000	0.756	1.125	0.125	9.000	16.364

T value at significance of 0.05=1.895

Table 4, represents significant differences between pre and post-test in all physical and technical test, were calculated t value was between (2.339:13.840).

DISCUSSION

Indoor training was a challenging experience for keeping athletes in action. Lack of space, partnership cooperation and sport equipment were the first challenges to both athletes and trainers. To investigate the impact of indoor training on athletes' status the researcher chose physiological, physical and technical variables, as representors of athletes' overall well-being. Wrestling is a high intensity sport with short interval of performance where wrestlers always attempt to maximize their muscle size and power (Yoon, 2002), although wrestling is characterized with anaerobic system, many studies used VO_2max as a detector of wrestlers status (Arslanoğlu, 2015; Ramirez-Velez, et al., 2014). VO_2max is considered one of the common indicators of evaluating aerobic capacity and body energy system. VO_2max reflects a player's overall fitness level, it is also known as aerobic and oxidative capacity, where it represents the maximum oxygen consumption used during building ATP (Hadžović-Džuvo, et al., 2014). VO_2max is characterized by the limits of ones oxygen transport system, and because its value does not vary from moment to moment, it gives a true indication of the athletes aerobic capacity (Scribbans, et al., 2016; Dlugosz, et al., 2013).

Physiological variables taken by through an ergometer cardiopulmonary testing showed significant difference in VO_2max reading, The recent study recorded mean of 47.194 mL/kg/min in the pre-test showing moderate status of the study sample. Reported values of international level wrestlers' are 45.9 ± 6.6 mL/kg/min for Colombian wrestlers, (Ramirez-Velez, et al., 2014), 49 mL/kg/min for Turkish wrestlers (Arslanoğlu, 2015), and 59.8 mL/kg/min for Polish wrestlers (Hübner-Woźniak, et al., 2009). Post-test of VO_2max recorded decreased mean with 43.489 mL/kg/min in wrestlers reading after indoor training showing the decrease of aerobic capacity with 2.057%, that can be attributed to less of working area, lack of performance endurance where there is no colleague or opponent to challenge, the attitude of the training program which depended on small resistance with short time endurance, but as a physiological detector, the post reading is still in the frame of high trained athletes reading according to the relative studies (Heywood, 2006).

BF (breathing frequency) is the number of breaths per minutes. Adaptive breathing frequency is decreased in trained athletes at rest with 7-8 breaths/minute, where it ranges about 12-20 breaths/minute in untrained individual. This reduction in breathing frequency represents greater respiration efficiency which attributed to adequate training or physical exercises (Gulam, 2016), unlike the measured BF during exercise where breathing frequency rises related to the high efficiency of athletes' respiration (Nicolò, et al., 2017). Recent reading of BF showed a little reduction with 6.132%, related to VO_2max reduction showing minor retreat of respiration efficiency caused by the less endurance enclosed in the indoor training program.

RER is the ratio between the amount of exerted carbon dioxide (CO2) exhaled and the inhaled oxygen (O2) showing the energy expenditure during the performance (Ramos-Jiménez, et al., 2008). RER is related to the high training intensity that could determine the anaerobic threshold of the athletes (Bellar, and Judge, 2012), matching the wrestling energy regime. RER value is considered a proper indicator of overall physical fitness (Bearden, et al., 2004). Recent RER reading recorded insignificant increase with 3.316% for the post-test where related studies emphasized unchanging values of RER in case of changing the training intensity (Houmard, et al., 1992), RER reduction signaling a drop in aerobic metabolism in of carbohydrate consumption matching the results of related studies (Bellar, and Judge, 2012; Rietjens, 2001), recent reading also related to decrease in

VO_2max and BF collected from post-test of the sample wrestlers showing the physiological changes in anaerobic capacity and fatigue threshold.

Insignificant increase in calories expended in the post-test with 1.446%, reflecting the change in energy expenditure and fast fatigue threshold of the wrestlers after the reduction of the training bout "indoor training" matching the results of related studies (Madsen, 1993; Mujika, and Padilla, 2001).

The training program in this study cared avoiding the detraining condition that may result out of "stay home" restriction, although the detraining influence the athletes after a long period of cutting the training off (Mujika, and Padilla, 2001), but studies pointed that a less amount of training may help in reducing the impact of detraining effect (MacDougall, and Sale, n.d.), that was the priority of this study. The researcher tried to preserve the physical and technical capabilities as well, so the training program depended on short bouts of specific physical exercises, the physical pre/post-tests of the wrestlers were significantly changed as little increase with 2.057% and 3.433%, in muscular strength represented in hand grip test for right and left handgrip respectively, where hand grip strength is considered a detector of overall body strength and successful wrestling performance (García-Pallarés, et al., 2011; Iermakov, et al., 2016), the recorded increased in right and left hand grip test is due to the focus of the training program on single joint action strength exercises as it's a successful method of increasing the overall body strength (Gentil, et al., 2015), and because of the ease of its performance and the less equipment needed, that was convenient with home training. Back muscle strength test as well is considered a successful method of testing wrestlers strength capability (Guilhem, et al., 2014), where relative studies emphasized on its crucial impact in wrestling performance (García-Pallarés, et al., 2011; Kraemer, et al., 2001), recent study resulted significant increase in back muscle reading in post-test with 2.292%, which also directs the influence of single joint muscle strengthening in wrestlers as performed in the study program matching the related study which showed the slow effect of reducing the exercising bouts on isometric strength of back muscles (de França, et al., 2015; Tucci, et al., 1992). On the contrary, back mobility test recorded significant reduction with 20.673% as the single joint resistance exercise resulted in a strong but stiff body in contrast with resistive wide range of motion resulted in technical performance with actual opponent weight, then the applied exercises of single joint increased the muscles strength but lowered the mobility of back muscle which in compatible with related studies (Basar, et al., 2014; Chaabene, et al., 2017) unlike the findings of other related studies which demonstrated a little increase in back flexibility out of muscle strengthening only (Leite, et al., 2017; Saraiva, et al., 2014). Technical variables recorded significant reduction with 34.756% for performance efficiency in score, and 16.364% for performance efficiency in time, which represent the performance endurance. This reduction was related to previous decrease in physiological and physical variables indicating the integrating adaptation of athlete's body (Swärd, 1990).

CONCLUSIONS

Wrestling performance was influenced by the change in training regime due to "stay home" COVID-19 restrictions. Although athletes maintained their muscular strength, but the long period of change in training regime, with short bouts of resistive physical and technical exercises affected the back flexibility and physiological variables with reduction in VO_2max, BF, RER, and little change in calorie expenditure. Performance efficiency decreased, especially in performance endurance measured in time and score, in correlation with the physiological variables. Indoor training succeeded in ceasing the influence of detraining, but wasn't sufficient enough to simulate real performing with opponent resistance.

Conflict of interest: the authors declare that this study is self-funded, and there is no conflict of interest.

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