113 - TEMPORAL VARIATION OF AEROBIC CAPACITY AND HEART RATE PARAMETERS OF INDIVIDUALS EXPOSED TO THE SAME PROFESSIONAL PERFORMANCE STANDARD

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INTRODUCTION

Big cities give rise peculiar problems, among which is the urban transportation. Buses are one of the most widely used means of transportation in Brazilian cities and around the world, contributing to people displacement. However, relatively precarious working conditions appeared due to the effective usage of this means of transport and we could see through some Brazilians and foreigners studies that the bus drivers fall ill in a different way than population in general.

Several researches have shown that a bus driver is exposed to stressful activities that involve not only his health, but also the passengers and the pedestrian safety. According to Costa et al (2003) within the concept of validity system that is an agreed concept in specialized literature for referring to morbidity conditions diagnose, it is perfectly reasonable to seek explanations for the health problems of these drivers under the conditions in which they live and work.

Being healthy is a dynamic situation, that is, an inaccurate condition which may change depending on various factors such as general working conditions, physical inactivity, workplace, among others that set different situations to the bus drivers daily routine (Robazzi et al., 2002). For Wang and Lin (2001), published studies on bus drivers health condition have received less attention for over two decades.

In face of the growing importance of this professional category, we propose to verify how the aerobic capacity values in bus drivers aged 25 to 57 years varied at a two-year interval.

METHODOLOGY

An observational study was scored for two consecutive years and consisted of observations at three different times. The sample comprised of 179 male bus drivers, aged 25 to 57 years, all of them bus drivers belonging to a bus company from an interstate transportation in Bahia, Brazil. The selection criteria included the following: being driver of that company, have done a physical assessment in any gym in Feira de Santana - Bahia, absence of health problems at the time of physical assessments, have been evaluated in a two-year interval, with three observations in this period, the interval between the observations could not exceed 15 months and at least 9 months; drivers ought to present results on all variables selected for the study. The variables analyzed, which were the object of this study were: VO2 max (Astrand Test) and Heart Rate.

PROCEDURES

We collected data from physical assessment records of a gym in Feira de Santana. For recording it was used a physical test program for Windows. All measurements were assessed by two graduate teachers in Physical Education who were unaware of the study hypothesis. The test battery consisted of: VO2 max (Astrand Test) and Heart Rate. The subjects were grouped under five age groups: Group 1 - Drivers belonging to the age group of 25 to 30 years old (G1). Group 2 - Drivers aged 31-35 years (G2). Group 3 - Drivers aged 36-40 years (G3). Group 4 - Drivers aged 41-45 years (G4). Group 5 - Drivers aged 46-59 years (G5). Blood Pressure and Aerobic Capacity Measurements: blood pressure data were obtained by indirect measurement according to the following procedure: during the first evaluation, the blood pressure of the driver was checked twice by both physical education teachers who were not aware of the study hypothesis through a traditional sphygmomanometer, allowing a minimum interval of 5 minutes between the measurements. Blood pressure was measured in the right arm of each worker in the seated position, held in a restricted service room, after at least five minutes of rest. For the purposes of analysis, the average of two measurements for the brachial perimeter was considered. Patients with systolic blood pressure (SBP) greater than or equal to 140mmHg were considered hypertensive; Or diastolic blood pressure greater than or equal to 90mmHg. Cardio respiratory assessment: Sub maximal test in cycle ergometer - Astrand (cit. in Physical Test, 1996). Before starting the test, the bike saddle height (knee in slight flexion) was adjusted, and the participant was accommodated in the bicycle in comfortable position (the hip could not oscillate during the pedaling). The participant cycled at a constant speed of 50rpm (+ or -21km/h). The test was performed between 6 and 12 minutes, depending on the physiological responses (more precisely the heart rate) throughout the test. In a practical and methodological way, the test was divided up three stages: Stage 01 four-minute warm-up exercises followed by the Stage 02 stress test in which the duration depended on the heart rate until reaching the "Steady-state". Depending on the participant, Stage 03 (explained as follows) will be a need.

The determination of the load used in each stage (load 1 for stage 01, and load 2 for stage 02), met the following criteria:

Frame 01 – ID eterminning loads (Astrand test)

KIDS AND SEDENTARY PEOPLE		ATHLETES ANDYOUNG PEOPLE	
Mechanic			
Load 1	0,5 Kp	**Load 1**	1 Kp
Load 2	2,0 % body weight	**Load2**	4,0 % body weight

Fonte: Physical Test (1996)

Heart rate and blood pressure were measured at rest, that is, before the test. During the test, heart rate was measured every minute and blood pressure every one to two minutes. Furthermore, the perception of the stress intensity performed by the participant was set every minute, from Borg scale (Frame 01). The test was performed in two stages. The first stage lasted four minutes and served as an adaptation to the stress test. The second stage could present variation related to the duration. From the increase in load, the heart rate was expected to stabilize between the third and fourth first minutes of the second stage, rating between 140 and 170 bpm. This stabilization can be defined as the difference of not more than 4 bpm between heart rates of two

minutes in a row, and was criterion for the closure of the test. If this balance did not occur within the heart rate range or the specified period, the test was extended until no more than 4 beats were observed within two minutes. However, this stabilization, in some cases, could occur in the first two minutes of the second stage. If in the first minutes of the second stage the heart rate, despite having increased with the effort, had not reached 120 bpm, we should and increase the load by another 0.5 kp, which will be called load 3 and proceeded with the test normally. It was recommended by the evaluation program that the duration of the test should not exceed the twelfth minute and that it be adopted during the Borg scale test.

Statistical analysis: the collected data were introduced in said computerized program SPSS 11.0, to apply the statistical treatments.

RESULTS AND DISCUSSION

Descriptive statistics of VO2max (Astrand Test) of the five bus drivers age groups.

Table 01. Descriptive statistics, arithmetic mean and standard deviation of the Aerobic Capacity (Astrand Test) of the five age groups of bus drivers

Variables	N	Minimum	Maximum	Average Standard Deviation	25-30 years G1	31-35 years G2	36-40 years G3	41-45 years G4	46-59 years G5
VO2 Max1	179	14,98	45,55	24,32 ± 5,64	26,0 ± 6,5	25,8 ± 5,5	24,4 ± 5,8	23,2 ± 4,2	22,6 ± 6,1
VO2 Max2	179	13,74	41,52	26,19 ± 4,92	28,6 ± 5,6	27,5 ± 4,4	27,0 ± 4,6	25,3 ± 4,5	22,8 ± 4,1
VO2 Max3	179	15,91	45,02	27,68 ± 5,08	30,7 ± 6,0	29,6 ± 4,8	28,6 ± 4,3	25,5 ± 4,2	24,8 ± 4,3

Through the Astrand test which the bus drivers were submitted to, we could observe a minimum value of 13.74 ml / kg / min and a maximum value of 45.55 ml / kg / min. The mean values in the three observations were between 24.32 ml / kg / min and 27.68 ml / kg / min. As this test was developed for athletes we noticed low values in the maximum volume of oxygen among the bus drivers, however we could evidence an increase in the results by comparing the observations. By means of the maximum oxygen volume we highlight an improvement in the aerobic capacity of the drivers, which may be associated to an improvement in the adaptation to the test used and/or the increase in the practice of systematized or non-systematized aerobic exercises practiced by the drivers after the results of the first evaluation.

In the results of Astrand's aerobic tests, we highlight an increase in the maximum volume of oxygen in all groups, that is, improvements in the results in the means from the first to the second observation and from the second to the third observation. In all groups the results were increasing, and this increase was more prominent in G1, G2 and G3 that increased by around 15%, and in G4 and G5 we noticed an increase, however around 10%, and we could, by data, suggest a reduction in the improvement in mean aerobic capacity in after 40-year-old drivers.

Descriptive statistics of physiological variables (Astrand test) of the five age groups of bus drivers.

The lowest resting heart rate found among all drivers was 56 bpm (beats per minute) and the highest heart rate was 120 bpm. The mean resting heart rate was around 79 bpm in the three observations, showing little change in this physiological phenomenon (see table 02).

Table 02. Descriptive statistics, arithmetic mean and standard deviation of the physiological variables (Astrand test) of the five age groups of bus drivers

Variables	N	Mínimo	Máximo	Average Standard Deviation	25-30 years G1	31-35 years G2	36-40 years G3	41-45 years G4	46-59 years G5
HR Resting1	179	60	112	79,94 ±10,88	88,8 ±14,15	79,6 ±8,88	80,79 ±10,64	76,4 ±9,17	78,2 ±10,82
HR Resting2	179	56	120	79,63 ±9,85	83,7 ±12,15	81,2 ±9,99	79,42 ±10,14	79,3 ±7,37	77,6 ±10,37
HR Resting3	179	56	116	79,63 ±10,34	84 ±12,73	79,7 ±10,08	78,12 ±10,66	80 ±8,83	78,3 ±10,31
Systolic1	179	90	160	119,72 ±9,20	119 ±7,88	120.2 ±8,80	119 ±10,19	119,53 ±8,43	120,6 ±10,45
Systolic2	179	100	150	118,24 ±8,76	114,7 ±7,86	116,3 ±7,66	119,7 ±10,11	118,1 ±7,32	120,9 ±9,62
Systolic3	179	100	150	116,48 ±8,17	114 ±5,98	116,3 ±7,33	116,2 ±7,87	115,3 ±8,26	120 ±9,83
Diastolic1	179	60	100	78,55 ±7,94	75,5 ±7,59	78 ±7,14	78,14 ±8,79	79,7 ±7,71	80 ±8,03
Diastolic2	179	50	90	76,37 ±6,76	73,5 ±6,70	75,6 ±5,93	76,05 ±8,20	77 ±6,37	78,7 ±5,53
Diastolic3	179	60	100	76,59 ±6,87	74,5 ±6,04	76,5 ±7,28	75,5 ±7,33	76,7 ±6,44	79,06 ±6,40
HR Stabilized1	179	104	187	139,38 ±15,97	144,5 ±19,88	139,1 ±14,33	140,7 ±16,63	137,8 ±13,22	136,8 ±17,77

The mean resting heart rate in all groups ranged from 77 bpm to 88 bpm. The highest values were found in G1, the group of younger drivers, and the lowest values were found in G5, the older group. Perhaps this difference is due to the maturity and tranquility of the older drivers in carrying out the evaluations, since in the final results of the aerobic capacity these data have been reversed.

Systolic blood pressure reached a minimum value of 90 mm / Hg and a maximum value of 160 mm / Hg, mean of 119.72 mm / Hg on the first observation, 118.24 mm / Hg on the second observation and 116.48 mm / Hg In the third observation, pointing to an improvement in the meantime.

In the systolic blood pressure measurement (SBP), we found in the means results a decrease in each group from the first to the third observation. The lowest values are in the G1 drivers, and these SBP values present, in most cases, an increase

from group to group, presenting a limiting factor, with advancing age, for the best health determinants. Yet, in the values in all groups, from the first to the third evaluation, SBP decreased and this decrease was less perceived in G5 individuals.

Diastolic blood pressure had a minimum value of 50 mm / Hg, a maximum value of 100 mm / Hg, a mean of 78.55 mm / Hg on the first observation, 76.37 mm / Hg on the second observation and 76.59 mm / Hg In the third observation, a small improvement from the first to the second was noticed, and from this a stabilization.

In the diastolic blood pressure (SBP) measurements, we found a decrease in each group, from the first to the second observation, and from the second to the third observation in the results of the averages. From group to group these PAD values increased with advancing age, but were less perceived from G3 to G4, and more evident from G1 to G2 and from G4 to G5.

In the stabilized heart rate results, during Astrand test, we found 104 bpm as the minimum value, and 193 bpm as the maximum value. In the averages of the values of the stabilized heart rate, we obtained 139 bpm, 132 bpm and 128 bpm for the first, second and third observations respectively.

At stabilized heart rate (SHR), noted in Astrand test, drivers revealed adverse conditions in the aerobic condition results. These results from SHR were higher in the drivers of group 1, and the lower values in G3 and G5. In all groups, we observed a decrease in the average of the FCE from the first to the second accompanied evaluation, and from the second to the third accompanied evaluation. Also in these data we observed that the standard deviation of the means decreased from the first to the last observation, making this data closer to the drivers. The mean resting heart rate was around 79 bpm in the three observations, showing little change in this physiological phenomenon.

CONCLUSION

In the aerobic tests results we highlight an increase in the maximum volume of oxygen in all groups, that is, improvements in the results in the means from the first to the second observation and from the second to the third observation, which may be associated to an improvement in the adaptation to the test used and/or the increase of the practice of systematized or non-systematized aerobic exercises practiced by the drivers after the first assessment results. There is no single best program for the development of cardio respiratory resistance, many factors must be considered in each particular situation, respecting the biological individuality of each individual (Amoedo, 2004).

The younger drivers presented the best results related to aerobic capacity while the older drivers the smaller ones. Systolic and diastolic blood pressure improved over time. The highest resting heart rate values were found in G1, the group of younger drivers, and the lowest values were found in G5, the older group. Perhaps this difference is due to thee maturity and tranquility of the older drivers in carrying out the assessments. This study emphasizes that, all in all, it is only through the physical evaluations performed that individuals present an improvement in their health indicators over time. Changes in the working conditions and environment of bus drivers are necessary in order to minimize the repercussions of work on these workers health.

REFERENCES

AMOEDO, C. A. (2004). A importância do equilíbrio, da diversificação e planejamento de atividades físicas em academias em prol de uma melhor qualidade de vida. Sitientibus – Ciências da saúde. Revista da Universidade Estadual de Feira de Santana, n. 30, p. 61-76, jan./jun.

COSTA L. B. et al. Morbidade declarada e condições de trabalho: o caso dos motoristas de São Paulo e Belo Horizonte. São Paulo em Perspectiva, 17(2): 54-67, 2003.

KERLINGER, F. N. Metodologia da pesquisa em ciências sociais. São Paulo: EPU / EDUSP, 1980.

PHYSICAL TEST 3.2.(1994-2000). Sistema de Avaliação Física e Nutricional para adultos e crianças. User Guide. Terrazul informática Ltda.

ROBAZZI, M.L.C.C. et al, (2002). Valores de pressão arterial em trabalhadores de uma instituição universitária.Ciência e enfermaria, 8 (1): 57-65. 2002.

WANG, P.D. & LIN, R.S. (2001). Coronary heart disease risk factors in urban bus drivers.Public Health, 115, 261-264.

TEMPORAL VARIATION OF AEROBIC CAPACITY AND HEART RATE PARAMETERS OF INDIVIDUALS EXPOSED TO THE SAME PROFESSIONAL PERFORMANCE STANDARD

ABSTRACT

The aim of the study was to survey aimed how aerobic capacity and heart rate values in bus drivers aged 25-57 years varied over a time interval of two years. The precarious occupational health, for the bus drivers, is relatively frequent among these workers. National and international studies have shown that the bus drivers fall ill in and die a different way compared to the population in general. The work was observational, punctuated for two consecutive years and consisted of observations, in three distinct moments, of values of aerobic capacity and heart rate. The study sample consisted of 179 males, aged 25-57 years, all bus drivers belonging to a company of interstate transportation from Bahia-Brazil. The subjects were divided in to five age groups. The data collected were introduced into referred computerized program SPSS11.0, to apply statistical treatments. This work emphasizes that through the physical evaluations performed the individuals present, in a general way, an improvement in their indicators of aerobic capacity (VO2 maximum) and heart rate with the passage of time. We still need to deepen into more scientific studies about major changes in working conditions and workplace, and healthy habits of the bus drivers that are required in order to minimize the impact on the occupational health of these workers. Therefore, it is believed that a program of physical evaluation and health promotion is essential for better working conditions for these workers.

KEYWORDS: bus drivers, aerobic capacity, heart rate.

VARIATION TEMPORAIRE PARAMETRES AÉROBIE CAPACITÊ ET FREQUENCE CARDIAQUE DES INDIVIDUS EXPOSÉS À LA SAME PERFORMANCE PROFESSIONNEL STANDARD

RÉSUMÉ

Le but de l'étude était de voir comment faire varier dans un intervalle de temps de deux ans, les valeurs de la capacité aérobie et la fréquence cardiaque chez les conducteurs de bus âgés de 25 à 57 ans. La santé au travail précaire pour les chauffeurs de bus, est une condition relativement fréquente chez ces travailleurs. Études scientifiques nationale et internationalesont montré que les conducteurs d'autobus sont tomber malades et mourir différente de la population en général. L'étude a été d'observation, a reçu pendant deux ans d'affilée et se composait des observations, à trois moments différents des valeurs de capacidad aeróbie et frêquence cardiaque. L'échantillon de l'étudeétait composée de 179 individus du sexe masculin, avec âgés de 25 à 57 ans, tous les chauffeurs de bus appartenant à une entreprise de transport inter-états de l'Etat de Bahia-Brésil. Les sujets ont été répartis en cinq groupes d'âge. Les données recueillies ont été introduit dans le programme informatisé SPSS 11.0, pour d'appliquer les traitements statistiques. Ce travail souligne que grâce à des évaluations physiques mené

personnes présentes en général, une amélioration de leurs indicateurs de capacité aérobie (VO2 max) et la fréquence cardiaque, avec le passage du temps. Nousavons encore besoin d'approfondir plusdes études scientifiques sur les grands changements dans les conditions et milieu de travail et des habitudes saines, dans les chauffeurs de bus, qui sont nécessaires, afin de minimiser les répercussions professionnels sur la santé au travail de ces travailleurs. Par conséquent, il est considéré comme d'une importance essentielle d'un programme d'évaluation physique et la promotion de la santé pour les meilleures conditions de travail pour ces travailleurs.

MOTS CLÉS: Chauffeurs d'autobus, capacité aérobie, fréquence cardiaque.

VARIACIÓN TEMPORAL DE LOS PARÁMETROS DE LA CAPACIDAD AERÓBICA Y LA FRECUENCIA CARDÍACA DE PERSONAS EXPUESTAS AL MISMO NIVEL DE DESEMPEÑO PROFESIONAL

RESUMEN

El objetivo de este estúdio fue verificar como varia en un intervalo de tiempo de dos años los valores capacidad aeróbica y la frecuencia cardíaca en conductores de autobuses con edades entre los 25 y 57 años. La salud en el trabajo de estas personas suele ser relativamente deficiente. Estudios cientificos nacionales e internacionales estan mostrando que los conductores de autobuses presentan una manera de enfermar y morir diferente a la poblacion en general. El trabajo fue de observación y se basó en estudiar durante dos años a los conductores de autobuses en tres momentos distintos, con un tes de capacidad aeróbica y la frecuencia cardíaca. Este estudio se dio en 179 personas de sexo masculino, con edades entre 25 y 57 años, todos conductores de autobuses, pertenecientes a una empresa de transporte del estado de Bahia, Brasil. Los sujetos en estudio fueron divididos en cinco grupos, por edad. Los datos recogidos se plasmaron en un programa informatico SSPS 11.0, para aplicar los tratamientos estadisticos. Este trabajo afirma que a traves de evaluaciones fisicas realizadas a estos individuos, en general, mejoran sus indicadores de la capacidad aeróbica (VO2 máximo) y la frecuencia cardíaca a lo largo del tiempo. Todavia necesitamos profundizar con otros estudios cientificios sobre cambios importantes en las condiciones y sitio de trabajo, hábitos saludables, de los conductores de autobuses, disposiciones necesarias que tienen como objetivo reducir los impactos acerca de la salud de estos trabajadores. Por lo tanto, se cree que es de una importancia esencial de un programa de evaluación física y promoción de la salud para mejores condiciones de trabajo para estos trabajadores.

PALABRAS CLAVE: Los conductores de autobús, capacidad aeróbica, frecuencia cardíaca.

VARIAÇÃO TEMPORAL DOS PARÂMETROS DE CAPACIDADE AERÓBICA E FREQUÊNCIA CARDÍACA DE INDIVÍDUOS EXPOSTOS A UM MESMO PADRÃO DE DESEMPENHO PROFISSIONAL

RESUMO

O objetivo do estudo foi verificar como variaram num intervalo temporal de dois anos, os valores neuromusculares e de flexibilidade em motoristas de ônibus com idade entre 25 a 57 anos. A saúde ocupacional precária, para os motoristas de ônibus, é condição relativamente freqüente entre estes trabalhadores. Estudos científicos nacionais e internacionais têm evidenciado que os motoristas de ônibus apresentam um adoecer e morrer diferente da população em geral. O trabalho foi observacional, pontuados durante dois anos seguidos e constituiu-se de observações, em três momentos distintos, de valores da capacidade aeróbica e freqüência cardíaca. A amostra do estudo foi constituída por 179 indivíduos do sexo masculino, com idade entre 25 a 57 anos, todos motoristas de ônibus pertencentes a uma empresa de transporte interestadual do estado da Bahia-Brasil. Os sujeitos foram divididos em cinco grupos etários. Os dados recolhidos foram introduzidos no referido programa informatizado SPSS 11.0, para aplicar os tratamentos estatísticos. Este trabalho destaca que através das avaliações físicas realizadas os indivíduos apresentam de uma forma geral, uma melhora nos seus indicadores de capacidade aeróbica (VO2 máximo) e de freqüência cardíaca com o decorrer do tempo. Ainda necessitamos aprofundar em mais estudos científicos sobre as grandes mudanças nas condições e ambiente de trabalho, e hábitos saudáveis, dos motoristas de ônibus, que são necessárias, visando minimizar as repercussões ocupacionais sobre a saúde destes trabalhadores. Portanto acredita-se, ser de essencial importância um programa de avaliação e de promoção da saúde para melhores condições de trabalho para estes trabalhadores.

PALAVRAS CHAVE: Motoristas de ônibus, capacidade aeróbica, freqüência cardíaca.