167 - INFLUENCE OF THE NOISE AND VIBRATION OF THE PUBLIC TRANSPORT (SUBWAY) ON THE HEALTH OF USERS

MÔNICA THATYELLEN SILVA DO NASCIMENTO;
LETICIA ERINS DE SOUZA;
EMILIN PRISCILA DA SILVA;
SORAYA GARCIA AUDI
Faculdades Metropolitanas Unidas, São Paulo, S.P., Brasil
monicathatyellen@gmail.com

doi:10.16887/86.a1.167

INTRODUCTION

The urbanization is growing disorderly way and an urban land occupation that disregards that premises of sustainable development, urban movement which occurs together with government, allowing potentially polluting activities live side by side with homes, hospitals, day care centers etc (WHO, 1995).

Before all kinds of environmental degradation, noise occupies a prominent place, and the noise was long regarded as a by-product of human activity, something indispensable in modern society, having earned thus due attention by the competent authorities (WHO, 1995).

In contrast to other environmental problems, noise pollution continues to grow and is accompanied by an increase in people exposed to noise complaints. The situation is untenable because it involves direct and cumulative negative health effects. This form of pollution can also adversely affect future generations, considering the deterioration of residential environments, social and learning and also involving economic losses (WHO, 1995).

The sound is an essential part of the activities of living beings and of nature's elements, but excessive noise causes negative effects on the hearing aid. The notion of what is noise can vary from person to person, but the body has physical limitations to support it, and bring a lot of harm to people, some of them irreversible. In contrast to many other environmental problems, noise pollution is growing every day because since 1992 is the only negative environmental impact on which the number of complaints has increased (OHRSTROM, 2005).

Formed in April 1968, the Metropolitan Train Company of the São Paulo – Subway, had North-South line of work after other months. The first train ride was help in 1972 between Jabaquara and Saúde stations. The first commercial operation took place in 1974. Today, the São Paulo subway has five lines in operation, 68.5Km network, 61 stations and 154 trains. In 2014, 1.1 billions passengers passed through the subway system (Metrô, 2015).

The World Health Organization (WHO, 1980) classifies the noise as a third of the main environmental problems worldwide, behind the air pollution and water, maintaining the same position when it comes to occupation problems, and the two spots, occupied by diseases caused by pesticides and osteoarticular. However, there are few epidemiological studies related to noise pollution, specifically the noise (GOMES, 1989 apud PETIAN, 2008).

The noise it's an undesirable, unpleasant sound, reaching harmful levels to health and public peace, is now called noise pollution, in general, it's understood that nice being should be considered sound otherwise, will be classified as noise (MOTA, 2003).

Technically, not only noise as a sound, whether meaning or not, whether message or not, has a determinable amount of energy that can be derived from processes or activities and spreads the waveform environment, from the production source the receiver of the hearing the determinable speed and varying the intensity and pressure in dependence on the distance and the physical environment (BRASIL, 1981).

The decibel (dB) is a logarithmic unit which indicates the proportion of a physical quantity (usually power or intensity) in relation to a specific level or implied reference. A ration in decibels is equal to ten times the base 10 logarithm of the ratio of two amounts of energy. A decibel is one tenth of un bel, a unit rarely used (BIPM, 2005).

The table 1show the level or noise pollution and what the effect is caused by every decibel level.

Levels of Noise Pollution	Negative Effects
Up to 50 dB	No effect
50-65 dB	Decreases the concentration and affect productivity in intellectual work
65-70 dB	Decreases the immune residence. Induce the release of endorphins, making the organism dependent. Increase in the blood cholesterol concentration.
Above 70 dB	Increase the risk of heart attack, infections, and other serious diseases. Changes occur in the auditory system.

According to the NR15 means for continuous or intermittent noise, for the purposes of application of the tolerance limits, the noise than noise impact. The exposure time to the noise levels should not exceed the limits of tolerance in accordance with table 2 (NR 15, 1990).

As affects of noise on heath in general, are registered major symptoms of fatigue, lassitude and weakness. The heart rhythm accelerates and blood pressure increases. As for the respiratory system, may register breathlessness and choking printing. As regards the digestive tract, fundamental for human balance glands are affected as adrenal, pituitary, etc (FIORÍLLO 2008).

MATERIALS AND METHODS

The research is classified as descriptive and interviewed 100 users of the São Paulo subway who were on the waiting list or exit the stations of blue, green and red lines on a weekday in the time from 8 a.m. to 11:45 a.m. The survey was conducted in two stages. The first was through a questionnaire with 7 closed questions which aimed to analyze the effects caused by noise in the subway. In the second step, the measurement was performed by dosimeter method using the sound level meter (device which measures the intensity of noise), rated analyzer environments because its capacity: 750°C/ 95°C UR/ 130 dB / 20000 LUX, the Instrutherm brand, THDL-400 model series 06081460 in the results were displayed in tables and graphs simple frequency, expressed in numbers and percentages.

OBJECTIVES

Check the sound impact of the subway on the health of populations user of blue, green and red lines on weekdays.

RESULTS

Graph 1 – Distribution percentages with respect to how they feel the São Paulo subway users in red, blue and green lines.

Tiredness/ weakness may simply be related to the breakneck pace of daily life and can be a serious symptom of poor health.

Irritation is like a radio hiss out of season. It's an ego defense mechanism. Your senses take the information from the environment and the people there and what you see, hear and feel, isn't within their acceptance of standards possibly the system will begin to suffer stress, causing mood swings, physical discomfort and, consequently, a lot of irritation.

To run the day-to-day stress and fatigue are increasing too, and suffer most from this, of course, it's our body with muscle pain. The pain can also arise from heavy physical training and muscle wrong positions that people often do.

Nausea isn't a disease but a symptom of various conditions, many of which are related to the stomach. Nausea often I indicative of an underlying condition other parts of the body. Usually the fact that a person with appetite leave suddenly to want to eat, it can have numerous causes.

The appetite is regulated by a sensory area that evaluates hunger and releases hormones that tell the body it's time to eat.

EEG studies show changes, demonstrating that noise, even of low intensity, causing the complex called “K”, so the temporary passage of a state of deep sleep to a lighter one.

Stress is a reaction of the body (physical and mental) to an extreme or significant effort. In general, the active stress hormonal and nervous processes based on an alert, which explains the increase in heart rate and alertness. The stimuli that trigger a stress reaction in the body are called stressors.

TABLE 1: Distribution in decibels according to measurements taken in lines red, blue and green of São Paulo subway (SP).

Subway Lines Analyzed	Region	Decibel
Line Red	East -West	67 dB
Line Blue	North - South	107 dB
Line Green	Vl. Madalena – Vl. Prudente	88 dB
Σ	3	

According to the measurements performed trains, the survey revealed, as noisier stretch, the blue line (north – south), more specifically between the Carandiru stations and Tucuruvi station to the subway, the level of noise detected was 107 dB. According to ABNT, this value can be compared with noise emitted by clubs or even the takeoff of an airplane.

The figures for the green line, were not very different from assuming the value of 88 dB, values health risk for those who use this transportation as a means of locomotion, can be compared to the noise emitted by noises by factory or even by the traffic in São Paulo.

The red line (east – west) was considered the least noisy line, resulting in 67 dB, this value can acceptable tone of conversation within the recommendations set forth by ABNT.

CONCLUSION

In relation to measurement noise, the results suggest that the pathways analyzed, wheezing was less red line, assuming a result of 67 dB. This value can be compared to a normal and acceptable tone of conversation within the recommendations set forth by ABNT. The Subway Operations Center reported that the cars received this line spray paint with nano particles of oxygen, which causes the sound waves lose intensity. This type of sound is used in the recording studio and is in test phase in subway stations and already has a 33% noise reduction.

Already the most noisy line is blue, with 107 Db. According to regulatory norms NR-15 is allowed to be exposed to this noise by up to 25 minutes, however, it's the authors' knowledge that the route is one hour.

Regarding the consequences caused by the noise, stress is the consequence that more is present. This also justifies all other indices of pathologies detected as mentioned above.

At the end of this research, it can be concluded that the authorities and relevant sectors are aware of the situation, however, lack more initiative so that there is an improvement in all seasons, not only the subway and train them too.

REFERENCES

WHO – WORLD HEALTH ORGANIZATION. “Community Noise”. In: Archieves of the Center for Sensory. Volume 2. Stockholm, 1995.

OHRSTROM, Evy et al. Effects of simultaneous exposure to noise from road and railway traffic. In: THE 2005 INTERNATIONAL CONGRESS AND EXPOSITION ON NOISE CONTROL ENGINEERING – INTER-NOISE, 2005, Rio de Janeiro. Anais... Rio de Janeiro: Sobrac, 2005.

Companhia do Metropolitano de São Paulo – Metrô. Disponível em http://www.metro.sp.gov.br/metro/institucional/quem-somos/index.aspx Acesso em: 15 nov. 2015.

MOTA, Suetônio. Introdução à engenharia ambiental. Rio de Janeiro: ABES, 1997.

_____. Urbanização e meio ambiente. Rio de Janeiro: ABES, 1999.

BRASIL, Lei nº 6.938, de 31 de agosto de 1981. Dispõe sobre a Política Nacional do Meio Ambiente, seus fins e mecanismos de formulação e aplicação, e dá outras providências. Diário Oficial da União, Poder Executivo, Brasília, DF, 02 set. 1981.

BIPM Comitê Internacional de Pessoas e Medidas. Sob os termos da Convenção do Metrô, 2005.

MANZANA, Antonio Calvo (Coord.). El ruido en la ciudad, gestión y control. Sociedad Española de Acústica, 1998.

NR 15 – Normas Regulatória. Anexo I – Limites de Tolerância para Ruído Contínuo ou Intermitente, 1990.

FIORILLO, Celso Antonio Pacheco. Curso de direito ambiental brasileiro. 9. ed. São Paulo: Saraiva, 2008.

Mônica thatyellen silva do nascimento, Endereço: Rua Guntur nº 44 A, bairro vale das virtudes.

INFLUENCE OF THE NOISE AND VIBRATION OF THE PUBLIC TRANSPORT (SUBWAY) ON THE HEALTH OF

USERS

ABSTRACT

Introduction: In the face of all kinds of environmental degradation, noise occupies a prominent place, and the noise was long regarded as a product of stress in the population. Objective: To determine the noise impact of the subway in the user's health. Methodology: It is a transversal, descriptive, explanatory, study whose initial sample, was composed by 100 users of the subway in the city of São Paulo of the lines: blue, red and green, that they set out to answer a form whose questions were used as variables in the study as well as measure the noise and vibration using as reference the levels of noise established by CONAMA Resolution n ° 1/90 establishing the criteria ABNT for noise emitted by the subway. The assessment was performed by the dosimeter method with the use of the sound level meter, the three lines of the São Paulo subway. The data after compiled were presented in tables and simple frequency charts expressed in numbers and percentages. Results: The results show that 37% of users feel stressed; 21% claim to have irritability; 12% have sleep disturbances; 10% feel tired; 9% had nausea frame; 6% muscle aches and 5% report having lost appetite. In relation to the express noises in decibels, the results show that the red line is 67dB; on the blue line are 107 dB and on the green line 88 dB. Thus, it can be concluded that the red line is the one that has less noise, is that you can buy to a conversation with normal sound. With regard to the consequences caused by noises, stress is more presented, which is the result of the absorption of noise pollution.

KEYWORDS: Noise pollution; Noise; Vibration; Sound effects; Subway.

INFLUENCE DU BRUIT ET DES VIBRATIONS DU TRANSPORT EN COMMUN (MÉTRO) SUR LA SANTÉ DES UTILISATEURS

RÉSUMÉ

Introduction: Dans le visage de tous les types de dégradation de l'environnement, le bruit occupe une place prépondérante, et le bruit a longtemps été considéré comme un produit de stress dans la population.Objectif :vérifierl'impactsonoredumétro à lasanté de l'utilisateur. Méthodologie :ils'agit d'une étudetransversale, descriptive, explicative, dontl'échantilloninitial se composait de 100 utilisateursdumétro de São Paulo leslignesbleues, rouges et jaunes, quiontbienvoulusrépondre à unformulairedontlesquestionsontétéutiliséescommedesvariablesdansl'étudeenplus de mesurerlebruit et lesvibrationsenutilisantcommeréférencelesniveaux de bruitcréés par larésolution CONAMA nº 1/90 établissantlescritèresL'AssociationBrésilienne de normestechniques (ABNT), pourlebruitémis par lemétro. La mesure a étéréalisée par laméthode de ladosimétrieavecl'utilisationdescompteurs de décibel, entroislignes de métro de São Paulo. Aspectséthiquesontété observes. .Lesdonnéescompilées, étaientprésentéesdansles tableaux etgraphiques de simplefréquence, exprimées enombres et pourcentages.. Résultats :lesrésultatsmontrent que 37 % desutilisateurs se sententstressés ; 21 % disentqu'ilsontirritabilité ; 12 % ontdestroublesdusommeil ; 10 % se sententfatigués ; 9 % ontphoto de nausées ; douleursmusculaires de 6 % et 5 % déclarentavoirperte d'appétit. Encequi concerne lebruit, expriméendécibels, lesrésultatsmontrent que lalignerougesont 67 dB ; surlaligne verte et bleue de 107 dB ligne 88 dB. Ainsi, il est conclu que laligneavecmoins de bruit est rouge, cequi est assimilé à une conversationsurunton normal. Encequi concerne lesconséquencesprovoquées par lesbruits, le stress est leplusprésentéssoitlerésultat de l'absorption de lapollutionsonore.

MOTS-CLÉS: Nuisancessonores; Bruit, Vibrations, ImpactsSonores; Métro.

INFLUENCIA DEL RUIDO Y DE LA VIBRACIÓN DEL TRANSPORTE PÚBLICO (METRO) EN LA SALUD DE LOS USUARIOS

RESUMEN

Introducción: Delante de todos los tipos de degradación ambiental, la polución sonora ocupa un lugar de destaque y, el ruido, fue considerado a largo tiempo, como un producto del estrés en la población. Objetivo: Averiguar el impacto sonoro del metro en la salud del usuario. Metodología: Se trata de un estudio transversal, descriptivo, explicativo, cuya muestra inicial, fue compuesta por 100 usuarios del metro en la ciudad de São Paulo de las Líneas : Azul, Roja y Verde, que se dispusieron a contestar un formulario cuyas cuestiones fueron utilizadas como variables en el estudio bien como mensurar los ruidos y vibraciones utilizando como referencia los niveles de ruidos establecidos por la Resolución CONAMA n° 1/90 que establecen los criterios da ABNT, para ruidos emitidos por el metro. La mensuración fue realizada por el método de Docimetría con la utilización del decibelímetro, en las líneas del metro de la ciudad de São Paulo. Los aspectos étnicos fueron observados. Los datos después de compilados, fueron presentados en tablas y gráficos de frecuencia simple, expresos en números y porcentajes. Resultados: Los resultados obtenidos muestran que 37% de los usuarios siéntense estresados; 21% se dicen tener irritabilidad; 12% presentan disturbios del sueño; 10% siéntense cansados; 9% presentan manifestación de nauseas; 6% dolores musculares y 5% relatan tener pierda del apetito. En relación a los ruidos expresos en decibelios, los resultados muestran que la línea roja es de 67dB; en la línea azul son de 107 dB y en la línea verde 88 dB. Así, se puede concluir que la línea roja es la que tiene menos ruido, se que puede comprar a una conversa con sonido normal. Con relación a las consecuencias causadas por los ruidos, el estrés es lo más presentado, que es el resultado de la absorción de la polución sonora.

PALABRAS CLAVE: Polución sonora; Ruidos, Vibración, Impactos sonoros; Metro.

INFLUÊNCIA DO RUÍDO E DA VIBRAÇÃO DO TRANSPORTE PÚBLICO (METRÔ) NA SAÚDE DOS USUÁRIOS.

RESUMO

Introdução: Diante de todos os tipos de degradação ambiental, a poluição sonora ocupa um lugar de destaque e, o ruído, foi considerado por muito tempo, como um produto do stress na população. Objetivo: Verificar o impacto sonoro do Metrô na saúde do usuário. Metodologia Trata-se de um estudo transversal, descritivo, explicativo, cuja amostra inicial foi composta por 100 usuários do Metrô de São Paulo das Linhas Azul, Vermelha e Verde, que se dispuseram a responder um formulário cujas questões foram utilizadas como variáveis no estudo bem como medir os ruído e vibração utilizando como referencia os níveis de ruídos estabelecidos pela Resolução CONAMA nº 1/90 que estabelece os critérios da ABNT, para ruídos emitidos pelo Metrô. A medição foi realizada pelo método de dosimetria com a utilização do decibelímetro, nas três linhas do Metrô de São Paulo. Os aspectos éticos foram observados. Os dados após compilados, foram apresentados em tabelas e gráficos de frequência simples, expressos em números e percentagens. Resultados: Os resultados obtidos mostram que 37% dos usuários se sentem estressados; 21% dizem ter irritabilidade; 12% apresentam distúrbios do sono; 10% se sentem cansados; 9% apresentam quadro de náuseas; 6% dores musculares e 5% relatam ter perda do apetite. Em relação aos ruídos expressos em decibéis, os resultados mostram que na linha vermelha são de 67 dB; na linha azul de 107 dB e na linha verde 88 dB. Assim, conclui-se que a linha com menor ruído é a vermelha, que é comparado a uma conversa em um tom normal. Em relação às conseqüências causadas pelos ruídos, o estresse é o mais apresentado que é o resultado da absorção da poluição sonora.

PALAVRAS-CHAVE: Poluição sonora; Ruídos, Vibração, impactos sonoros; Metrô.