Noise and 'Pedagogic Efficiency' in School Activities

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Summary. A group of 8 pupils born in 1962 and a group of 8 future teachers between 25 and 40 years of age, were submitted in 1975 to two types of tests in the presence of environment noises at various levels (45 to 75 dB_A), in order to assess the influence of this nuisance on the pedagogic efficiency. The results show a nocivity threshold for the pupils at around 55 dB_A and for the teachers at around 65 dB_A. Furthermore, backward pupils suffer more in this context from the interference of noise than the advanced ones.

The school population (pupils as well as teachers) is known to be very sensitive to noise. The children are exposed to this nuisance not only in class-rooms (traffic and airplane noise, etc.) but also at home[3] (radio, house-appliances, loud conversations, etc.). Teachers in the presence of noise must raise their voices in order to be understood and this additional effort leads quite frequently to a state of vocal and/or nervous fatigue.

This is why we have studied the influence of noise in the school environment with regard to both 'vocal hygiene' and 'pedagogic efficiency'. As far as 'vocal hygiene' is concerned, one of the authors has published 2 papers showing that in order to maintain the vocal organ in a healthy condition, the teacher's voice should not exceed 65 dB_A[4]. This implies that for easy understanding of the teacher's message the ambient noise should be below 55 dB_A, in agreement with most situations where oral communication is important[5].

This paper deals especially with an investigation relative to the 'pedagogic efficiency' aspect of the problem, which was conducted in 1975 with a group of 8 youngsters (4 boys and 4 girls) from schools of the 'cycle d'orientation' of the canton of Geneva, all born in 1962, and a group of 8 future teachers (of both sexes) between 25 and 40 years of age. 2 boys and 2 girls were advanced pupils (with excellent marks in French, mathematics and general average) and the other 2 boys and 2 girls were backward pupils (with bad marks in the disciplines mentionned); all of them were shown by medical examination to possess a normal hearing system. All the participants were greatly interested in this investigation.

Each of the 2 groups (pupils and teachers) was submitted to 2 types of tests in an acoustically isolated studio[6]. In these tests words were dictated or orders were given at a constant level of 65 dB_A, and at the same time different types of noises were diffused at 45, 55, 65 and 75 dB_A respectively.

The first test consisted in the dictation of 20 phonetically balanced French words and 4 logatoms (polysyllabic words having no meaning) and was meant to give us some indications on auditory perception and speech intelligibility[7]. The second test comprized a succession of orders, asking the subjects first to put a cipher inside or outside

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[4] L. Grosjean, *La parole, la voix et la pédagogie* (1973) and *Bruit, voix et pédagogie* (1975), département de l'instruction publique, Genève.

[5] See for instance, *Public Health and Welfare Criteria for Noise* US Environmental Protection Agency, Washington, D.C. 20460, 1973).

[6] The authors are indebted to Mr. R. Olivetti and his colleagues of the 'Service des moyens audio-visuels de l'enseignement secondaire, Genève' for their technical help.

[7] J. C. Webster, Proc. of the Int. Congress on Noise as a Public Health Problem (US Government Printing Office, Washington, D.C. 20402, 1973), p. 25.

Mean losses (in %) for each group and for each test in the presence of 3 types of environment noises at various levels (in dB_A)

Type of Noise	Level (dB_A)	Mean losses (%)					
		Teachers			Pupils		
		1st test[a]	2nd test Part 1[b]	Part 2[c]	1st test[a]	2nd test Part 1[b]	Part 2[c]
Traffic	45	4	0	4	10	0	16
	55	6	2	0	12	0	19
	65	12	14	18	48	6	38
	75	65	81	96	73	59	40
Airplane	45	5	0	0	10	0	0
	55	5	0	3	10	0	6
	65	10	0	0	41	0	12
	75	21	76	46	55	27	40
'Text' (radio)	45	4	0	3	16	4	3
	55	4	0	0	20	0	3
	65	11	2	3	24	0	25
	75	28	55	82	51	50	38

[a] 1st test = words + logatoms (20 + 4). [b] 2nd test, Part 1 = to put a cipher inside or outside geometric figures. [c] 2nd test, Part 2 = simple oral arithmetric exercises to be written down in a given order.

6 simple geometric figures, then to write down in a given order the results of the following 4 arithmetic exercises: 3 single operations (division, multiplication or addition) and a combination of 3 successive operations, each of all these operations being simple enough as to create no handicap for the backward pupils. This test was meant to give us some indications of the influence of noise on the faculties of attention and reasoning.

The noise diffused during the tests were either pure sounds of 40, 250, and 1000 Hz respectively, or the following pre-recorded environment noises: 1. traffic noise (in a noisy cross-road), 2. airplane noise (near the airport of Geneva-Cointrin) and 3. 'text' (a text read with the rhythm used for speech in the radio in order to simulate radio playing while the pupils are doing their home-work).

A number of methods like the 'articulation index' (AI)[8], the 'speech interference level' (SIL)[9] etc., have been devised in order to evaluate the intelligibility of speech in the presence of various types of determined noises. In this paper, we shall give all our results using the simpler dB_A scale[5].

The mean losses (in %) for each group and each test in the presence of the environment noises mentionned at various levels (in the succession: 65, 55, 75 and 45 dB_A respectively) are summarized in the Table. Despite the small number of subjects in the 2 groups, the following (statistically significant) results can be drawn: 1. The losses in performance of the future teachers are lower than those of the pupils up to (and including) 65 dB_A; at 75 dB_A, although increasing for both groups, the losses are greater for the teachers. 2. A nocivity threshold (threshold where the losses start to increase more rapidly with the elevation of the noise level) can be detected at around 55 dB_A for the pupils and at around 65 dB_A for the teachers. 3. As expected, in the first test the losses in the audition of logatoms are much higher than the losses in the audition of known words (which are in turn higher than the losses in the audition of sentences)[5]. 4. With regard to the first part of the second test, we note that the losses are low (except at 75 dB_A); this result shows that the faculty of attention of both groups is not distracted by the noise (except at higher levels) because of the interest expressed by the participants in performing those tests; it is therefore very important to develop the motivation of the pupils towards the teaching they receive.

When the two tests are conducted in the presence of disturbing pure sounds of 40, 250, and 1000 Hz respectively (no tabulated presentation given here), the losses observed are much lower than those in the presence of environment noises (which exhibit complex spectra) and are more important at 250 Hz than at 1000 or 40 Hz. The losses calculated separately for the advanced pupils and for the backward pupils indicate that the advanced pupils do much better than the backward pupils; the differences, however, tend to vanish with the elevation of the noise level above 55 dB_A, especially for the losses in the audition of logatoms.

Although this study, which will be published in more detail in French elsewhere, should be extended to larger groups of pupils and teachers, we should like to draw once more the attention of the teaching staffs not only to the nocivity of noise in the school environment, but also to the fact that backward pupils resent the interference of noise to a much higher degree than the advanced students.

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Effect of Ascorbic Acid on Pigmentation of Toad (*Bufo melanostictus*)

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Summary. Administration of ascorbic acid in toad during breeding season results an increase in melanin pigments in skin, liver and vocal sac.

The role of sex steroids in the synthesis of melanin pigments has been reported in the rat[2] and bird[3]. Previous in vivo and in vitro studies indicate that testicular steroid hormone synthesis in toad appears to be increased by exogenous ascorbic acid (ASA)[4–6]. The influence of ASA on the pigmentation in toad is obscure. A significant fall of ASA in the testis[7] and the melanin pigments in the skin[8] has been observed in the hypophysectomized toad. From these observations, it seemed desirable to determine whether ASA had any role in melanin formation in toad.

Materials and methods. 16 male toads, weighing about 60 g, were used during the breeding season. The animals were divided into 2 groups of equal number. 1 group of animals received ASA (50 mg/100 g of body weight) by i.m. route. The remaining animals received 0.4 ml of amphibian saline and were treated as controls. 7 days after treatment animals were sacrificed simultaneously with controls. The liver, vocal sac and the skin from dorsal surface were taken separately from all the animals. Biochemical study of melanin was carried by spectrophotometric method[9]. The tissues were dried in a desiccator and digested with pepsin for 24 h. The melanin granules were separated by centrifugation and then digested with NaOH solution. The melanin concentration in solution was examined by spectrophotometer after filtration.

Results. The melanin pigments were found to be present in the toad skin, liver and vocal sac. The

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