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CASE REPORT

Influence of a vertical deviation of a 10-storey apartment building in Katowice, Poland, on selected mental functions of its occupants. A preliminary study*

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Abstract

Introduction and objectives: Coal exploitation technology could have affected the deformation of ground under a housing estate in the Upper Silesia agglomeration. The 10-storey apartment building began to deviate from the vertical. These factors affected the housing conditions of inhabitants in the block of flats. From 1991-2001, coal-mine surveyors monitored the vertical deviation. The inhabitants of the apartment building decided to put in a claim to their housing association which subsequently requested that the coal mine authorities repair the damages. The coal mine authorities initially refused to acknowledge inhabitants claim.

Materials and Methods: An interdisciplinary group of experts were engaged who examined the group of inhabitants. Generally accepted and evidence based psychological methods were selected and certified, and psychological equipment was used.

Results: Preliminary deductions showed a strict connection between psychical discomfort, negative stress and vertical deviation. Based on the experts' report, the housing association decided to sue the coal mine authorities who offered to settle the inhabitants' grievances out of court and to straighten the apartment building – an influenced decision.

Conclusions: This report is one of the best documented examples of a health impact assessment conducted in the 1990, a long time before the legal and methodological basis of Health Impact Assessment (HIA) and Environmental Impact Assessment (EIA) began to be implemented in other European countries.

Key words

health impact assessment, health risk assessment, environmental impact assessment, inhabitants, fears, vertical deviation

INTRODUCTION

The basic purpose of Health Impact Assessment (HIA) is to inform decision-makers at all levels about the potential health effects of implemented actions, projects, strategies and programmes. Another task is to activate representatives of different groups affected by given decisions and actions, and to carry out expert consultations [1]. The presented case study concerns all the necessary methodological conditions of typical HIA process which was conducted many years before the beginning of public European discourse about the possibility of its legal implementation.

Upper Silesia is a large, urban area, inhabited by approximately 4.8 million people. It has is a big concentration of heavy industry, especially mines and steelworks, which has undergone an intensive process of restructuring. As in many other parts of Poland, the Upper Silesia agglomeration has been urbanized with blocks of flats. One such area is a part of the city of Katowice called the 'Witos Housing Estate', was built on ground damaged by mining (3rd, i.e. highest degree), which affected the way in which the basements were constructed. Although basement construction should protect a building from damages connected with present and historical coal exploitation, the orography under the Witos Housing Estate is not homogeneous enough to ensure stable mining subsidence within the estate's border, in addition to which the surface deformation was much more complicated than previously assessed (e.g. the ground fault crossed one of the main street in this district).

The coal exploitation technology could have affected the ground deformation under the housing estate. The 10-storey apartment building started to deviate from the vertical. These factors affected the housing conditions of inhabitants of the block of flats at 28-28a Ossowskiego Street, and was first documented in 1991 [2].

The first group of experts from the Central Mining Institute carried out a survey and found [3] a 23 mm/m (23 per mill) vertical deviation. The new data was included in the expertise annex in November 1996 (Tab.1), and during next years, from

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Table 1. Vertical deviation dynamics of the two segments of the examined building

	Vertical deviation [per mill] (mm/m)	
Year	Segment A	Segment B
1995	23	23
1996	24.2	26.3
1997	25.9	28.8
2001	25.6	27.7

1991-2001, the coal-mine surveyors continued to monitor the vertical deviation The deviation of the apartment building varied, with the maximum value of deviations noted in February 1997 (25.9 per mill in segment No. 28 and 28.8 per mill in segment No. 28a). The values from 28 May 2001 were as follows: 25.6 per mill in segment No. 28, 27.7 per mill in segment No. 28a

The inhabitants of the apartment building decided to put in a claim to their housing association. The housing association authorities at first refused to process the inhabitants' claim – no permanent vertical deviation was mentioned as the main reason of the refusal, but after some time they requested that the coal mine authorities repair the damage. The coal mine authorities initially refused to acknowledge inhabitants claim. The apartment building association thereupon decided to ask experts from Institute of Occupational Medicine and Environmental Health to assess the situation and to report whether or not the vertical deviation affected the health of the inhabitants.

RESEARCH OBJECTIVES

In 2001, an interdisciplinary group of experts were engaged who examined a group of inhabitants from the building at 28-28a Ossowskiego Street. Their initial findings showed a significant correlation between psychical discomfort, negative stress and the vertical deviation of the building. Fears about the building collapsing (during frequent rock bursts) and existential fears were also observed, although some of the fears were irrational [4, 5]. Necessary observations were made which helped to determine the aim of the presented study and its range. The aim of the study was to assess the influence of the vertical deviation of the building on the health of its inhabitants.

MATERIAL AND METHODS

The research was carried out between 6-7 June 2001. 24 people living in the vertically deviated apartment building were examined (15 females and 9 males). The average age was 49 (25-66). Educational status differed: 7 persons completed elementary school, 9 completed secondary school, and 8 had graduated from university/technical school. All persons were examined individually, given instructions first and then examined psychologically, for which generally accepted and evidence-based psychological methods were chosen [6, 7]. Certified psychological equipment was used for the following tests:

- Eysenck Personality Questionnaire-Revised (EPQ-R) – for measuring three dimensions of personality. This is the most recent in a series of measures developed by the authors [8, 9].
- J. A. Taylor Questionnaire – to to assess the level of fears and restlessness [10].
- Self-Estimate Form by R. B. Cattell – for examining the general anxiety level and personal factors, e.g. self-assessment, neuroticism, suspiciousness, depressive self-uncertainty and emotional tension [11, 12].
- Digit Symbol Test – to estimate the sensomotor coordination and associative ability.
- Two Digit Tests – to measure attention divisibility and perceptivity, inclusive of the anticipation process and directed attention.
- Cross type tester (Riccasay) – to evaluate spatial reaction. cross type tester (Riccasay)

RESEARCH METHODOLOGY

The health influence assessment was estimated through the following steps:

Step 1 – *Pre-screening phase.* Data set – there was a constant need for using psychological tests. Researchers resigned to check somatic diseases and their relation with inhabitants' fears.

Step 2 – *Screening phase.* Preliminary assessment by experts to see if the fact of the vertical deviation seriously affected health.

The human is a part of a system connected with the surrounding world by sensory access [13]. The environment influences a human through this sensory access [14, 15, 16]. Among the worst negative influences are those connected with a place of residence and its negative conditions [17, 18]. This fact could also negatively affect a human while working [19]. It's also possible that vertical deviation disturbs social well-being. The mix of both vertical deviation and high altitude provokes restlessness and fear, of which fear is one of the most frequent symptom in psychopathology [20, 21, 22], and is also an important part of the somatic disease clinical outlook. Long-lasting fears could also affect some internal organs. There is a significant correlation between fears and vegetative problems which could also provoke somatic dysfunctions.

Step 3. To determine whether the environmental stress caused by long-term living in a vertically deviated building could provoke internal tensions, restlessness and fears. This problem was chosen as the main part of the presented study.

RESULTS

Problems involving restlessness, fear, internal tensions, personality integration, and neuroticism were observed (Tab. 2). The arithmetic average (showed in Taylor tests) [10] was 24 points. The following gradation was selected:

0-13 – norm
14-18 – borderline state
19-33 – fears and restlessness
34-50 – neurotic depression

Table 2. Results of the following factors: fear, restlessness, internal tensions, personality integration, neuroticism

No. of examined person	Results of particular tests				
	Taylor (points)	EN (sten)	Q_4 (sten)	Q_3 (sten)	N (sten)
1	14	7	8	3	1
2	15	6	8	3	4
3	32	10	10	5	8
4	27	8	10	7	6
5	21	7	7	7	6
6	10	6	9	2	1
7	6	5	4	1	1
8	30.5	9	10	9	8
9	26	9	10	4	5
10	41	9	10	4	6
11	12	6	7	7	4
12	38	9	10	4	6
13	32	9	10	7	4
14	24	8	8	5	4
15	26	6	8	3	5
16	40	10	10	7	10
17	24.5	8	7	3	6
18	20	6	7	3	3
19	24	7	10	5	5
20	13	7	7	5	6
21	16	6	8	3	4
22	27	8	9	6	5
23	25	8	19	5	7
24	35	9	10	5	8
Average	24	8	9	5	5

Table 3. Mental efficiency tests results

No. of examined person	Results of particular tests			
	Visual-Motor Analyzer (sten)	Digit symbol test (sten)	Popp (sten)	Raiskup (sten)
1	6	10	6	5
2	5	–	6	8
3	6	5	6	10
4	6	10	9	7
5	6	8	9	10
6	6	10	9	6
7	7	10	7	9
8	6	–	–	-
9	6	4	8	5
10	6	10	4	5
11	7	8	6	5
12	6	10	9	7
13	5	6	8	4
14	6	10	9	5
15	5	6	7	9
16	1	4	3	1
17	6	5	7	6
18	6	8	9	10
19	6	2	6	6
20	7	10	9	5
21	3	6	8	2
22	6	4	9	8
23	5	5	6	6
24	7	6	6	5
Average	6	7	7	6

The average result showed that 70% of the examined people were restless or suffered from fear, and a few persons had symptoms of neurotic depression. 12% of the examined group were in the borderline group. Less than 17% were restlessness and fear free.

The results obtained should be compared with dissolution analysis of the EN Test Cattel indicator, which also refers to fears and restlessness [11, 12]. There is a 10 degree scale: 1st sten – the lowest, 10th sten – the highest, i.e. worst result). The average result was 8 sten (high level of experienced fears) (Tab. 2). 70% of investigated persons were restless or suffered from fear, which confirmed the Taylor tests results.

The level of Q4 factor which identifies internal tensions was on about the 9 sten level – high level of internal tensions. Only one person was characterised by a low level of internal tension (4th sten). 53% of the examined persons had evident fears and restlessness which affected their behaviour, and 47% of them were characterized by unconscious fears and restlessness.

Integration of personality data (Q3) and neurotic disorders (N) were also observed (Tab. 2). The results were average. Psychical efficiency tests results were obtained by such research tools as the cross type tester and the Digit Symbol Test (Tab.3). Results were within the norm.

The report by the experts showed that the intensified, foregoing values referred to fears, restlessness, and internal fears [20, 23, 24]. Psychical efficiency was on the normal level, i.e. there was a negative impact of the environment [4, 25]. In this case, the only environmental reason could have been inadequate housing conditions: unstable, vertical deviation of the building combined with high attitude.

DISCUSSION

Living and working conditions have the biggest influence on human health [16, 26]. Nowadays, in both highly developed and developing countries, health impact assessment and environmental impact assessment have become key tools in the activities of public health specialists.

The presented report is one of the best documented examples of health impact assessment and health risk assessment conducted in the late 1990, much earlier than the implementation of any other legal and methodological assessments. Poland has a long history of scientific research for developing different methods to assess impact on population health, even during time of the former Communist system, although it was not introduced obligatory until after Poland's admission into the European Union in 2004.

The impact assessment is generally defined as anticipating or assessing the consequences of currently conducted or proposed actions [27]. The International Agency for Impact

Assessment (IAIA) defines impact assessment as a process for identifying future consequences of currently conducted actions. Health Impact Assessment (HIA) is a combination of procedures, methods and tools by which a policy, programme or project may be judged as to its potential effects on the health of a population [1].

Environmental Impact Assessment (EIA) is a process for identifying and anticipating the potential environmental impact of actions, policies, programmes and projects [28]. A breakthrough moment in conducting EIA was the passing in USA of The National Environmental Policy Act of 1969 (NEPA) [28]. From that moment on, EIA has been institutionalized. The EIA strategy is now used in Europe, the USA, Canada, Australia and Oceania, as well as in the countries of far eastern Asia [27].

Directive 85/337/EEC (EIA 85/337/EEC) of 27 June 1985 relates to assessing the environmental effects caused by public and private undertakings which may considerably influence the environment. In accordance with article 1 of the directive, a project means the execution of construction works or of other installations or schemes, or other interventions in the natural surroundings and landscape (including those involving the extraction of mineral resources). This article defines a developer as the applicant for authorization for a private project or the public authority which initiates a project. Article 2 of the directive 85/337/EEC obligated the member states to adopt all measures necessary to ensure that, before consent is given, projects likely to have significant effects on the environment by virtue *inter alia,* of their nature, size or location, are made subject to an assessment with regard to their effects. In accordance with article 3 of the directive from June 27, 1985 EIA should identify, describe and assess in an appropriate manner, in each individual case, the direct and indirect effects of a project or action on human beings, fauna and flora, soil, water, air, climate and the landscape, as well as material assets and cultural heritage [29]. Council Directive of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment 85/337/EEC has been amended and perfected by Council Directive 97/11/EC of 3 March 1997, which amended Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment [30].

Elements of the Health Impact Assessment (HIA). Analysis of the evidence pertaining to anticipated relations between the policy, programme or project, and health of the population, taking into account:
- the opinions, experience and expectations of those who may be affected by the proposed projects, programmes and policy;
- an increase in the awareness of decision-makers and communities interested in the effects on health of the policy, programme or project;
- the recommendations which make it possible to maximize the positive effect on health and to decrease the negative impact [1].

The majority of previous HIA applications pertained to projects and strategies of acting at the regional and local level and, to a lesser degree, at the national level [31].

The World Health Organization (WHO), in its strategy suggests using HIA in the case of implementing any plans, decisions, programmes and legal regulations which may have a direct impact on health, as well as an indirect impact on social, economic and environmental conditions of local communities [32, 33]. Similar recommendations are given by the European Commission. HIA should bring together practical experience coming from the work of local public administration officials, obtained data and scientific evidence in the area of a given community, expertise and experience resulting from applying the already discussed HIA strategy [34, 35].

SUMMARY OF TEST RESULTS

The results were as follows:
1) the arithmetic average of the Taylor test (24 points) showed high level of fears and restlessness;
2) the Catell inventory results (EN – 8 sten) showed high level of restless and fears;
3) the Q4 indicator (internal tensions) was also high – 9 sten;
4) 53% of the surveyed were characterized by evident, conscious fears and restlessness;
5) perception, attention divisibility and spatial response efficiency were within thein norm.

CONCLUSIONS

The conclusions of the report were as follows:
1) fear is one of the most frequent symptoms in psychopathology. The results showed that more than a half of the examined persons had fears and restlessness;
2) the high level of fears and restlessness was most likely caused by the vertical deviation of the building;
3) a long-lasting, increased level of internal fears and restlessness had a negative influence on the organic system of those examined, and could have provoked somatic disorders.

Among the worst negative influences are those connected with a place of residence and its negative conditions. It is also possible that vertical deviation disturbs social well-being. Based on the experts report, the housing association decided to sue the authorities of the coal mine, who offered to settle the problem pout of court and to straighten the apartment building – an influenced decision. A specialized construction company from the Ukraine was employed to straighten the apartment block. After some time, another 15 apartment buildings were also straightened.

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