

Do Plants in Offices promote Health ?

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Reports from the nineteen-eighties indicate that house plants are able to reduce the level of chemical compounds in the air. Both the leaves and the stems and roots participate in this cleansing process, together with micro-organisms which live in the root zone and the soil. Plants therefore offer an opportunity to improve the often polluted air indoors. They might therefore be able to ameliorate the negative effects on health caused by the atmosphere in public and private spaces.

However, plants do not just act as potential air purifiers. They also represent part of the original ecosystem in which mankind evolved. Plant species as we know them today have been around for some 150 million years. Human evolution only started 4.5 million years ago, and produced homo sapiens - modern man - about 100,000 years ago. Our entire evolutionary history was therefore closely linked to nature.

It is interesting to note that there have been only very minor changes in mankind's biology, physiology or genetics over the past 10,000 years. We are virtually identical to the people who lived at the end of the ice age, when the ice sheet covered large parts of northern Europe. On the other hand, our living environment has altered considerably, particularly in more recent times.

This started 250 years ago with the industrial revolution, which led to the urbanisation of the western world. Although this has only occurred over the last 50 to 70 years, mankind appears to have forgotten about its ties to the natural world. This development has cut us off from close contact with nature and has led to us spending a large proportion of our life surrounded by artificial things.

A modern lifestyle also presents us with a new situation in terms of psychological perspectives on our health. The study of the effect which our environment has on us is called 'environmental psychology'. Studies in this field have clearly shown that our environment has a significant effect on our sense of well-being, our emotional stability and our stress limits. They have shown that nature as encountered in parks, open spaces and forests leads to reduced stress. This raises the question: why does nature have this effect? One explanation for this appears to be provided by the concept of "psychological identity". It is not just the physical body that must ensure that we can live and survive in the wilds, but also mankind's psychological component. It is claimed that we switch on an 'automatic pilot' when we walk - for example - in the woods, that deep within us we have some kind of inherited consciousness which recognises nature and the natural elements as something familiar. On the other hand, when we are in an unfamiliar environment, we use a great deal of mental energy to ensure that a certain distance is maintained.

Our urbanised lifestyle also means - at least in the Scandinavian countries - that we spend 80% to 90% of our time in enclosed buildings. This emphasises the importance of the quality

of the indoor atmosphere, both in terms of the physical and chemical state of the air and with respect to psychological effect of the design of the indoor space.

Several studies from the past 10 to 15 years show that the view from the window can affect our sense of well-being. American studies carried out by Roger Ulrich amongst others have demonstrated that the view that a sick person has from their bed can affect a whole range of measurable stress reactions in patients. Ulrich proved that patients who could see vegetation took far fewer painkillers and were passed as healthy far more rapidly than patients who looked out on a concrete wall. A Swedish study concluded that office staff who looked out on areas with vegetation suffer less stress than those who look out on an area without plants, such as streets and car parks.

If the view through windows alone can affect not just the way in which mental stress is processed, but even the state of health, plants in the room should have the same effect. At the horticulture and plant institute at the Agricultural University of Norway we even found an additional effect, since plants affect the physical and chemical state of the indoor air. We therefore wanted to test whether it is possible to improve health by means of plants in the office. The study was carried out in conjunction with the occupational health service of Statoil, the largest oil company in Norway. A horticultural company - Greenteam - monitored the condition of the plants during the study. We also involved medical colleagues: a specialist in asthma and allergic disorders and various occupational health experts.

59 Statoil employees took part in the study. They work in office cubicles each covering 10 m². The study commenced in the autumn of 1994. At the time, there were no plants in any of the offices. The 59 subjects were split into two groups, A and B. Both were well mixed in terms of age and gender, and contained equal numbers of smokers. The average time spent working at the computer was also the same for both groups. During a control period from December 1994 to January 1995 we collected data about 12 different symptoms. These symptoms are largely attributable to the working environment, such as fatigue, headache, dry facial skin and dry skin on the hands, coughing, eye irritation. The data was obtained using questionnaires on which the degree to which the symptoms were present (on a scale of 0 to 3) could be indicated. The questionnaires were collected every other week.

The results showed no difference between the two groups in terms of the assessment of the state of health. Group A totalled the symptoms at an average of 7.8, and group B at 8.3. The P value is well above 0.05 (5%), so there is therefore no tendency towards differentiation between the two groups. We concluded from this that the two groups are very similar in terms of their symptoms relating to the indoor atmosphere.

For the actual experiment, all offices in group A (29 persons) were provided with plants in February 1995: three flower boxes containing *Oraceana deremensis*, *Aglaonema commutatum* and *Epipremnum aureum* (*Scindapsus aureum*) were placed at each window, and a terracotta tub was installed in the corner with a 1.5 metre high *Dracaena deremensis* and an *Epipremnum aureum* as the low-level plant.

The same questionnaire was collected every other week during the spring of 1995 (from week 6 to week 17), both from group A (whose members had plants in their office) and from group B (without plants).

The plants were moved to group B in February 1996, with group A serving as the control (so-called crossover). Once again, the questionnaires were collected every fortnight. Judged on all symptoms, a significant improvement can be established when plants are present in the office. Over the next three months, considerably fewer health problems were reported. According to the findings, symptoms decreased by 25%. If we divide 12 symptoms on the questionnaire into three main categories, the following picture emerges: Group 1 covers general symptoms - fatigue, befuddledness, headache, dizziness and daze together with concentration problems. We found a significant fall in these general symptoms, particularly fatigue and headache, which fell by 30% and 20% respectively, when the subjects had plants in their office.

Group 2 covers symptoms of the mucous membranes - itching, burning or irritated eyes, irritated or blocked nose or a runny nose, hoarseness and a dry throat together with coughing. These symptoms were also significantly reduced by plants: hoarseness and a dry throat by around 30% and coughing by around 40%.

Group 3 covers the head symptoms: dry or irritated facial skin, dandruff, itching scalp and ears and dry, itching skin on the hands. The presence of plants led to a significant change in the skin symptoms if we look at the results for the face, scalp, ears and hands overall. One symptom that certainly occurred significantly less often was dry facial skin, where the reduction was around 25%.

This study was not conducted in order to examine the causes of the changes in the symptoms. Yet I would like to explore possible explanations. The presence of plants can probably result in a positive change in the psychosocial working environment. The resultant feeling of well-being also affects how the individual assesses his/her state of health. Against the background of the psychobiological identity and mankind's positive reaction to nature we can assume that plants have a particular effect on the sense of well-being. This is evidenced by the fact that the occurrence of symptoms linked to the indoor atmosphere was reduced.

The individual experience of the subject's state of health can be at least partly explained by the following reasoning: an improved sense of well-being raises the levels of tolerance for irritation. Consequently, the individual will experience the indoor atmosphere more favourably if there are plants in the working environment.

On the other hand, we can also assume that plants can have a direct effect on the atmosphere; according to American research findings, houseplants break down a variety of chemical compounds in the air. They may also slightly raise the ambient humidity, as English studies suggest. These two factors can lead to an improvement in the indoor atmosphere, which in turn leads to fewer health problems. My personal opinion is in any case that the psychosocial effect (i.e. increased sense of well-being) has a significantly greater significance for our findings as a direct consequence of the air quality.

In addition to the information, we wanted feedback on how the subjects experienced the presence of plants in their workplace. To that end, we sent a new questionnaire to all participants a month after the completion of the health stage, in which we asked for their views regarding the plants.

56% of participants felt that the plants took up a lot of room. The positioning of the plants in the office should therefore be done in such a way that the workplace is not noticeably restricted, for example by hanging the plants in the window or on the wall. Only 11% felt that plants had caused problems in the workplace.

A proportionately large number of subjects felt that the air in the office had been improved when it contained plants (22% agreed with this fully, and 24% partly). The majority said that they felt more comfortable with plants (84% agreed fully or partly). Amongst 51 subjects who participated in the experiment to the end, there was a substantial desire to have plants in the office in future. 66% were fully in favour of this, and 16% partly in favour, making a total of 82%. Only one person fully opposed it.

We can therefore draw the following conclusions. Plants in offices can improve the sense of well-being and health. Health problems affected by the indoor atmosphere occur less frequently, and the employees feel the plants to be a positive element. It is consequently obvious to assume that plants can help reduce the costs resulting from short-term absence due to illness. Effectiveness at work can be improved both through the reduction in health problems and an increased sense of well-being. This is interesting from an economic perspective, not least because the individual planting can easily be adapted to the workplace in question. Finally, it should not be forgotten that the individual employee's sense of well-being is clearly promoted, and that plants in the workplace can therefore also help improve quality of life overall.

These were a few of the findings of the Norwegian study. As far as we know, this is the first study in the world to directly link the use of plants to health. With medical questions, two independent studies with similar findings are always required in order to be able to make definite statements. We therefore dare to draw the conclusion that plants in offices have a positive effect on individuals' health and sense of well-being. And we hope that our study can prompt further research in this field.

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obtained her doctorate at the Norwegian Agricultural University in Ås/Oslo in 1989. She has since worked at the Norwegian Institute for Horticulture and Botany and had been leading a study into the possible effect of plants on the health of office staff since 1994. Mrs Fjeld is also a lecturer at the Agricultural University and a member of the Scandinavian Society for Agricultural Research and the International Society of Horticultural Sciences.