

Thomas Eskolin
Tähdennonkuja 26
02240 ESPOO
No. 044 3468735

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**Changes in Gustatory Performance. The Effects of Smoking on
Sensing the Five Primary Taste Qualities and Water**

Ressun lukio
Supervisor Ms. Mari Juuti
Suomen Akatemia
Viksu kilpailu

MAKUAISITIN TOIMINNAN MUUTOKSET. TUPAKAN VAIKUTUS VIIDEN PERUSMAUN JA VEDEN TUNNISTAMISEEN

Tutkimuksen tavoitteena oli selvittää ja testata tupakoinnin vaikutusta makuaistiin. Tutkimus keskittyi erityisesti osoittamaan yhteyden nuorten epäterveellisten elämäntapojen ja makuaistin heikentymisen välillä. Henkilökohtaisena pontimena tutkimukselle oli havainto, että tupakoinnin vaikutusta makuaistiin ei ole laajemmin tutkittu sekä se, että aiheesta ei yleisesti keskustella.

Tutkimuksen empiirinen osa muodostui testisarjoista, jotka toteutettiin 17 – 19 -vuotiaille nuorille. Tutkittavat nuoret jaettiin kahteen ryhmään sen perusteella, tupakoivatko he: toisessa ryhmässä oli nuoria, jotka olivat tupakoineet pitkäkestoisesti tai vaihtelevan mittaisia kausia, toisen ryhmän nuoret eivät olleet tupakoineet. Testisarja muodostui lukuisista makutesteistä, joilla tutkittiin testattavien kykyä tunnistaa viittä perusmakua: hapanta, karvasta, suolaista, makeaa ja umamia sekä kuudentena näytteenä vettä.

Tutkimuksen tuloksena havaittiin, että tupakoivien nuorten kyky tunnistaa perusmakuja on heikompi kuin vertailuryhmän. Tutkimuksen perusteella voidaan myös päätellä, että tupakointi vaikuttaa erityisesti tiettyjen makujen tunnistamiseen; tupakoivilla nuorilla oli vaikeuksia tunnistaa hapanta, karvasta sekä suolaista, kun taas vertailuryhmällä ei ollut vaikeuksia tunnistaa näitä perusmakuja.

Tehdyn tutkimuksen merkittävyyttä kasvattaa osoitus siitä, että lyhytaikainenkin tupakointi voi vaikuttaa makuaistiin. Keskustelua tästä aiheesta tulisi lisätä erityisesti sen vuoksi, että se on yksi tupakoinnin haittoja, jotka vaikuttavat tupakoitsijaan nopeasti. Makujen herkkä tunnistaminen on olennainen elämänlaatua lisäävä tekijä, erityisesti tärkeässä kehitysvaiheessa oleville nuorille.

CHANGES IN GUSTATORY PERFORMANCE. THE EFFECTS OF SMOKING ON SENSING THE FIVE PRIMARY TASTE QUALITIES AND WATER

The purpose of this research was to investigate and test how the gustatory performance is influenced by smoking cigarettes. The objective was to focus on young people's gustatory functioning and the potential damage that may be caused by unhealthy life style. The basis for the study was the observation that the effects of tobacco consumption on gustation have not been generally discussed and therefore became a topic of personal interest.

An empirical series of tests were carried out among 17 to 19-year-old adolescents. The examinees were divided into two groups according to their smoking status: one group was composed of smokers and the other group of non-smokers. The tests consisted of recognition experiment of the five primary taste qualities, i.e. sour, bitter, sweet, salty and umami, in addition to water.

As a result of this investigation smoking adolescents' ability of to recognize different primary taste qualities seems to be reduced in comparison with the non-smoking adolescents. It could be pointed out that according to the results the variation in gustatory performance between the two groups was taste-specific; it is obvious that the sensitivity of smokers to identify sour, bitter and salty tastes was impaired compared to non-smokers who, in most of the cases, did not show any difficulties in recognizing these tastes.

The study was important because it provided an interesting aspect on how the functioning of the sense of taste can easily be impaired by smoking cigarettes already in the early stages of tobacco consumption. Discussion on this topic should be encouraged among adolescents because the sense of taste is obviously an imperative constituent of quality of life that is especially important for young people.

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1. Introduction

Cigarette is one of the deadliest industrial products that can be found in the worldwide markets and it is obvious that nowadays it would not gain access to the open markets as a new product. It has been estimated that smoking annually causes nearly five million deaths in the world (Vierola 2004) and that if the present trend will continue, by 2030 it will result in 10 million deaths per year. Globally altogether 47 % of men and 12 % of women smoke (Murray CJL, Lopez AD 1996). That means a total of 1.2 billion smokers in the world 800 million of which live in the developing countries (The World Bank, 1999). While the topic is well studied and its dangers rightly realized, it remains to a great extent actual, since the consumption of tobacco is increasing especially in adolescents.

As recently as in 1996 over 60 % of Chinese people thought that smoking has few or no harmful effects on health (Vierola 2004). Yet, the ideas and conceptions of smoking cigarettes have started to change during the past decades. The previous assumptions that tobacco is a sign of power and intelligence and that it is unrelated to health problems have gradually been replaced by information from recent studies. Active education on the damaging effects of tobacco has succeeded in affecting general attitudes towards smoking. The number of smokers in developed countries has decreased due to effective campaigning against tobacco, whereas in the developing world their number is still increasing (WHO, 1997).

Besides its many unpleasant consequences, such as bad smell, prematurely ageing skin and yellow teeth, smoking is the primary cause of a great number of diseases. It causes a wide range of different cancers, cardiovascular diseases, lung diseases, cerebral thrombosis (Huovinen 2004) and gustation and olfaction disorders (Vierola 2004).

Disorders related to gustation have a significant effect on the process of flavour perception and may therefore have a negative impact on an individual's health and food preferences. In this research I attempt thus to determine whether the assumption of smoking being an impairing factor for the sense of taste can be shown to be valid. So, the research question of this essay is: **How does smoking cigarettes affect the recognition of the five primary taste qualities and water?** The hypothesis of this research is that gustatory performance is impaired by smoking cigarettes.

Initially, the aim of this investigation was to perform a research on how olfaction affects the sense of taste and what other significant factors decrease the sensitivity for tasting. Yet, the relation between olfaction and gustation seemed to be too complicated to be investigated and was therefore omitted from the study. Other possibilities for topic appeared to be numerous including the effect of age, sex and smoking. Since I had had various discussions with one of my acquaintances concerning her experience of impaired gustation probably due to her smoking habits, I decided to concentrate on the effects of smoking on the gustatory performance, which seemed to be very significant and highly actual as a health hazard.

2. Literature Review

2.1 Smoking

Tobacco is classified as a substance that stimulates and relaxes the central nervous system (Wallinheimo 2004). It has an overall negative impact on the human body causing several diseases ranging from decreased physical performance to various highly dangerous cancers. WHO (1997) has characterized tobacco as one of the most significant health hazards in the world.

2.1.1 Health Hazards Related to Smoking

Cigarettes are constituted of about 4000 substances many of which cause very dangerous diseases. The most common toxic substances are nicotine, tar and carbon monoxide, which increase the chance of getting cardiovascular diseases, respiratory diseases and cancers. Every third cancer disease and cardiovascular disease is caused by smoking. (Vierola 2004)

The nicotine in cigarettes also results in physical and mental dependency (Cigarettes and Other Nicotine Products, 2005). During smoking the nicotine moves immediately to the blood circulation system after which it takes seven seconds for it to reach the brain. This leads to a dependency similar to cocaine and heroin.

2.2 Chemical Senses and Smoking

2.2.1 Chemical Senses

Whether an organism is able to survive in the nature depends on its ability to adapt itself into the changes that constantly take place in its surroundings. Even the most primitive unicellular organisms have this capability of collecting essential information for the changes in their own activities. Multicellular organisms have specific sense organs to control the environmental signals and to respond to the stimuli in an appropriate way. Humans have five basic senses, namely vision, touch, hearing, olfaction and gustation. The organs responsible for these senses to function are eyes,