

Smarties!

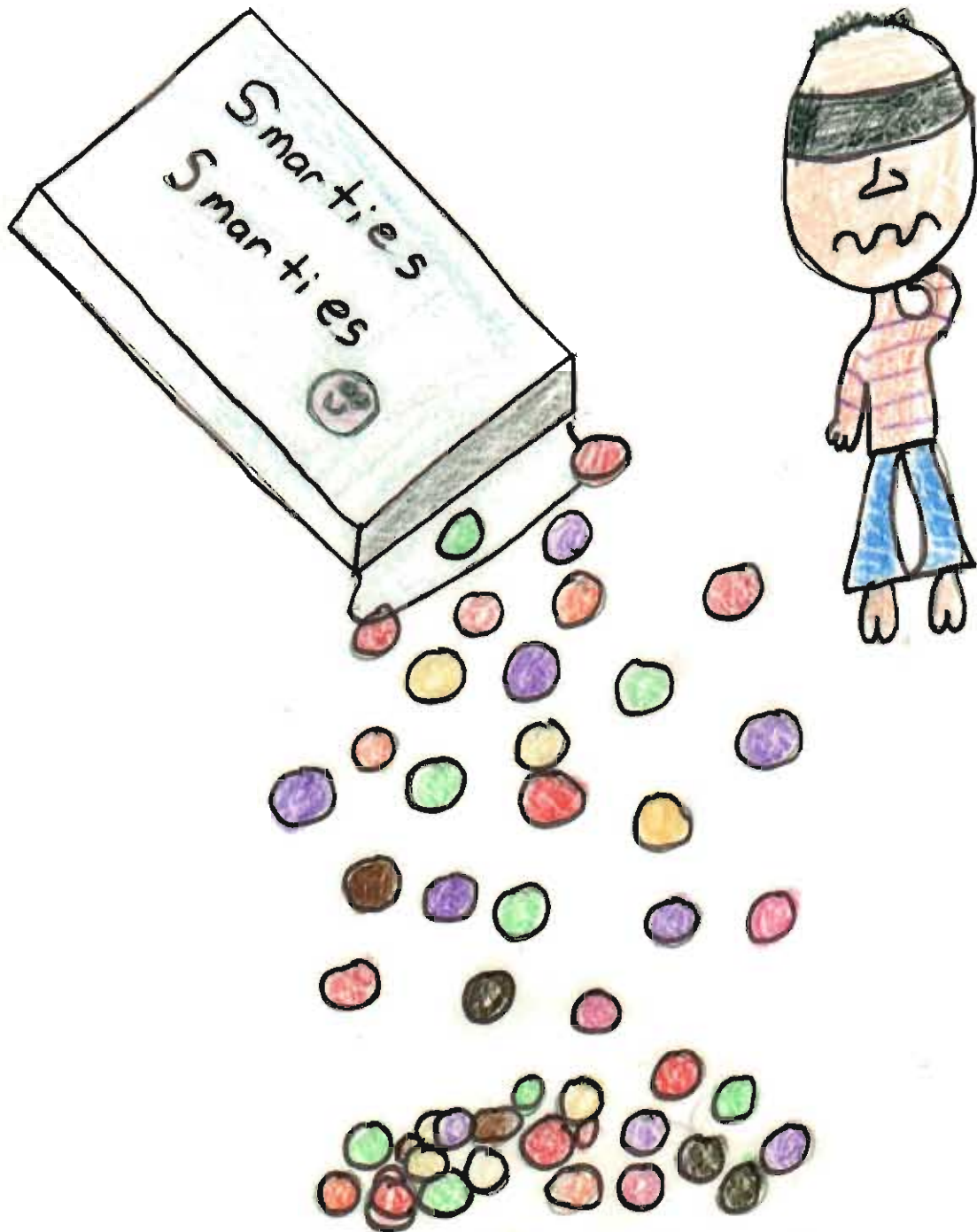


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PROBLEM

1. Can people in general, tell apart by taste, the different colours of Smarties?
2. Of the adults tested, does smoking hinder their tasting ability?

We selected this problem because we are curious as to the subtlety of the taste difference.

BACKGROUND READING

In our background reading, we read about natural and synthetic colouring and flavouring. We used the books, "Additive Alert" by Linda R. Pim, "Synthetic Food" by Magnus K. Pyke and "Chemicals we Eat" by Melvin A. Benarde. We found that flavouring in food intensifies flavour, masks flavour and creates a new flavour. Now the following flavours have been synthesized:

amyl acetate for banana
allyl caproate for pineapple
anethole for anise (licorice)
carvone for mint
cinnamaldehyde for cinnamon
ethyl pelarginate for brandy
alpha ionone for raspberry
phenylethyl isovalerate for peach
vanillin for vanilla

Many other tastes are also available

Synthetic flavouring is more widely used because it is cheaper, more constant in quality, and available year round.

There are many more natural flavourings than artificial, but they produce groups of tastes. For example, cardomom emits a sharp lemony flavour. It is used in processed meats and has two chemical components called cineole and terpineol.

The brain instantly rejects food that is not the right color in our unconscious standards. We all remember the Dr. Seuss book "Green Eggs and Ham", and how

the food was rejected because it looked unappetizing, but in the end it tasted fine.

Colouring agents mask colours or make foods the colours we would expect.

Annato is used to deepen the colour of margarine and butter. It comes from the pulpy parts of annato tree seeds. The United States has ten synthetic water soluble dyes that had been approved in 1971. They consisted of two blues, a green, a purple, three reds, two yellow and one other. Canada has thirty-two approved colours at present.

Ninety per cent of all colouring in foods is synthetic. They have a greater intensity of colour, are cheaper, and their production is not limited to what the crops produce. Mind you, some synthetics can't be used in some cases, so natural colorant will be used.

HYPOTHESIS

We hypothesize that most people will be able to tell apart the different flavours of Smarties, and smoking will hinder the tasting ability of adults.

TESTING THE HYPOTHESIS

The materials we used were: Smarties, a blindfold, plastic cups and water.

To test our hypothesis we took five people of the following groups: Male grade ones, female grade ones, male grade eights, female grade eights, male adult smokers, female adult smokers, male adult non-smokers, and female adult non-smokers.

In each case we tested people one at a time. Each person was either blindfolded, or closed their eyes. After explaining the procedure we gave them, one at a time, one Smartie of each colour. After every Smartie the subjects told us what colour they thought it was. In between Smarties they were given a drink of water to rinse the taste out of their mouth. No repeats of Smarties were given because it would not give true results. We did not tell them if they were right or what colours were left, both for the same reason as above. We did not repeat the choices because some people are not familiar with the colors.

We chose the groups of people listed above because grade ones and eights are basically the extreme ages. Adults were classified as eighteen and up. We originally were going to use grade twos and sevens in addition to the others but we decided that that would make the testing far too extensive. For testing the second half of our problem, we only used adults because children would not normally want to say if they smoked or not. Smoke inhalation is not a factor, we decided, because there is not way it can be measured, and it would never equal the concentration of smoke in a cigarette, cigar, or pipe.

OBSERVATIONS .6.

Early in our results, it appeared that younger children tested were having better results, as opposed to almost no results by adults. Female children also seemed to have better results than male. When we finished our testing, this was shown again. Grade one girls got 24 out of 40 Smarties correct, whereas grade one boys got 15 out of 24 correct. Grade eight boys did not do very well at all, for with 40 Smarties administered, only 4 were guessed correctly. Grade 8 girls got 11 out of 40, not that good, but still much better. In the adults tested, there was no pattern shown. Nobody had any idea of which color was which taste. This may have occurred for a number of reasons. Firstly they are less familiar with the product, and second of all, the sensitivity of their taste buds may have deteriorated to a point.

This trend is notable in the grade eights, but in a less conspicuous way. Female adult smokers averaged 1.2 correct out of eight. Female adult non-smokers averaged .6 correct out of 8. Male adult smokers averaged .8 out of 8. Male adult non-smokers averaged .4 correct out of 8. Male grade ones averaged 3 correct out of 8. Female grade ones averaged 4.8 correct out of 8. Male grade 8s averaged .8 correct out of 8, identical to the male adult smokers. Female grade 8s averaged 2.2 correct out of 8.

The order of average scoring from highest to lowest is:

Grade 1 girls - 4.8 out of 8

Grade 1 boys - 3 out of 8

Grade 8 girls - 2.2 out of 8

Female adult smokers - 1.2 out of 8

Grade 8 boys - male adult smokers - .8 out of 8

Female adult non-smokers - .6 out of 8

Male Adult non smokers .4 out of 8

Age Group; Male grade 1

Colour	Person 1	2	3	4	5
Red	Red	Orange	Green	Red	Red
Purple	Purple	Red	Light Brown	Pink	Red
Green	Yellow	Light Brown	Green	Green	Dark Brown
Orange	Pink	Purple	Green	orange	Purple
Yellow	Purple	Green	Yellow	Yellow	Red
Dark Brown	Dark Brown	Dark Brown	Pink	Dark Brown	Purple
Light Brown	Light Brown	Light Brown	Red	Red	Purple
Pink	Red	Orange	Purple	Green	Pink

Age Group: Female Grade 1

Colour	Person 1	2	3	4	5
Red	Red	Red	Red	Orange	Red
Purple	Purple	Purple	Red	Orange	purple
Green	Green	Green	Orange	Red	green
Orange	Orange	Pink	Orange	Red	Orange
Yellow	Yellow	Green	Light Brown	Pink	Yellow
Dark Brown	Pink	Dark Brown	green	Dark Brown	Dark Brown
Light Brown	Purple	Light Brown	Dark Brown	Light Brown	Light Brown
Pink	Pink	Pink	Orange	Green	Pink

Age Group: Male Grade 8

Colour	Person 1	2	3	4	5
Red	Dark Brown	Green	Light Brown	Purple	Yellow
Purple	Light Brown	Light Brown	Pink	Red	Green
Green	Pink	Purple	Purple	Dark Brown	Pink
Orange	Purple	orange	Green	Green	Orange
Yellow	Yellow	Pink	Dark Brown	Light Brown	Dark Brown
Dark Brown	Red	Red	Red	Pink	Red
Light Brown	green	Dark Brown	Red	Yellow	Purple
Pink	Pink	Yellow	Yellow	orange	Light Brown

Age Group: Female Grade 8

Colour	Person 1	2	3	4	5
Red	Red	Pink	Red	Pink	Light Brown
Purple	Purple	Yellow	Pink	orange	Red
Green	Green	Pink	Green	orange	Yellow
Orange	Orange	Orange	Orange	Green	Dark Brown
Yellow	Pink	Light Brown	Yellow	Dark Brown	Pink
Dark Brown	Dark Brown	Purple	Dark Brown	Yellow	Green
Light Brown	Dark Brown	Green	Light Brown	Light Brown	Red
Pink	Yellow	Red	Yellow	Red	Purple

Age Group: Male Adult Smoker

Colour	Person 1	2	3	4	5
Red	Light Brown	Dark Brown	Light Brown	Red	Red
Purple	Orange	Green	Pink	Yellow	Dark Brown
Green	Pink	Yellow	Dark Brown	Light Brown	Yellow
Orange	Purple	orange	Orange	Pink	Dark Brown
Yellow	Green	Purple	Green	Red	Green
Dark Brown	Red	Pink	Pink	Orange	Light Brown
Light Brown	Pink	Red	Purple	Pink	Yellow
Pink	Dark Brown	Light Brown	Dark Brown	Orange	Green

Age Group: Female Adult Smoker

Colour	Person 1	2	3	4	5
Red	Orange	Green	Dark Brown	Light Brown	Light Brown
Purple	Green	Purple	Orange	Yellow	Orange
Green	Pink	Light Brown	Pink	Orange	Red
Orange	Light Brown	Red	Green	Green	Green
Yellow	Yellow	Orange	Green	Yellow	Yellow
Dark Brown	Red	Pink	Light Brown	Dark Brown	Dark Brown
Light Brown	Dark Brown	Dark Brown	Red	Pink	Red
Pink	Purple	Yellow	Purple	Red	Purple

Age Group: male adult
non-smoker

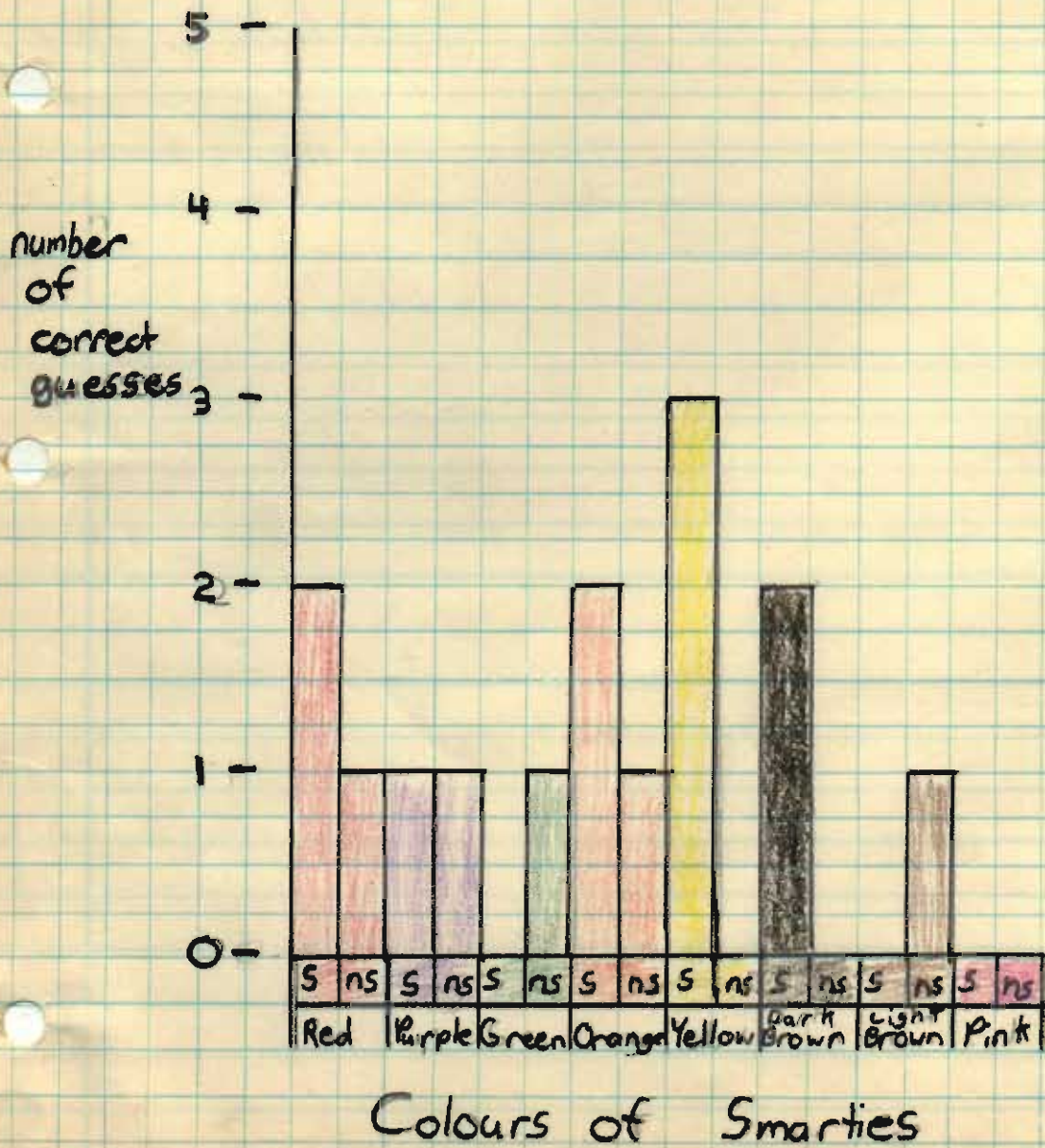
Colour	Person 1	2	3	4	5
Red	Green	Dark Brown	Light Brown	Yellow	Orange
Purple	Red	Pink	Orange	Orange	Green
Green	Yellow	Green	Light Brown	Pink	Dark Brown
Orange	Green	Light Brown	Pink	Yellow	Purple
Yellow	Yellow	Green	Green	Dark Brown	Green
Dark Brown	Pink	Orange	Red	Purple	Yellow
Light Brown	Dark Brown	Red	Dark Brown	Light Brown	Red
Pink	Orange	Purple	Orange	Purple	Purple

Age Group; Female Adult
Non-smoker

Colour	Person 1	2	3	4	5
Red	Green	Pink	Red	Yellow	Yellow
Purple	Light Brown	Dark Brown	Purple	Pink	Pink
Green	Dark Brown	Yellow	Orange	Yellow	Purple
Orange	Pink	Orange	Dark Brown	Light Brown	Green
Yellow	Orange	Green	Dark Brown	Purple	Light Brown
Dark Brown	Green	Purple	Light Brown	Green	Green
Light Brown	Yellow	Purple	Red	Purple	Dark Brown
Pink	Green	Green	Orange	Green	Yellow

Bar Graph Comparing Number of Correct Guesses on Smarties by Smokers and Non-Smokers

Legend
S = Smokers
NS = non-smokers



colour of smartie given	colour of smartie guessed	Red	Purple	Green	Orange	Yellow	Dark Brown	Light Brown	Pink
Red		12	1	5	4	4	4	7	3
Purple		6	7	4	7	3	2	4	7
Green		2	3	8	4	7	5	4	7
Orange		2	5	9	12	1	3	3	5
Yellow		2	4	10	2	9	5	4	4
Dark Brown		7	4	5	2	2	10	3	7
Light Brown		10	6	2	0	3	8	8	3
Pink		4	8	6	7	6	2	2	5

ACCEPTANCE OR REJECTION OF THE HYPOTHESIS

We must reject the first part of our hypothesis because in our hypothesis we predicted that:

1. most people would be able to tell apart the different flavours of Smarties, and
2. Smokers would have a harder time telling apart flavours.

The adults tested which were 50% of all the people we tested, did not score too well. The only group which did very well were the grade one girls. Most people could not tell apart the different flavours of Smarties.

All the adults tested had basically no idea of the colours, smokers and non-smokers alike. Therefore we must also reject the second part of our hypothesis.

APPLICATION

Our science fair project has some relevancy to current consumer affairs. A large problem in buying groceries is trying to get a wholesome product. There is a huge quantity of food additives (53,118,000 kg per year* or 2.27 kg per person) including the ones in the following chart:

<u>ADDITIVE</u>	<u>PURPOSE</u>	<u>EXAMPLE</u>
Colouring	changes colour	citrus red no. 2
Preservatives	stops spoilage	Butylated hydroxytoluene
Flavouring	gives new flavour	Vanillin
Flavour enhancers	Increases flavour	MSG
Texture agents	increases or modifies texture	polysorbate 60
Bleaching, maturing and Dough Conditioning Agents	replaces aging effect of flour	benzoyl peroxide
Anti-Caking Agents	Stops food from forming lumps	silicone dioxide
Food Enzymes	curdles milk	rennet
Acid/Base Balancing Agents	control acid balance	citric acid
Firming Agents	stop canned goods from going soft	calcium chloride
Sequestering Agents	inactivate any metal in food	calcium disodium EDTA (ethylenediaminetetraacetate)
Starch Modifying Agents	helps make starch usable	nitric acid
Glazing and Polishing Agents	makes candy shiny	carnauba wax (used in Smarties)
Extraction Solvents	extracts caffeine from coffee	Acetone
Anti-Foaming Agents	prevents foam in jam and cooking oil	Dimethylpolysiloxane
Humectants	stops food from drying out	Sorbitol
Pressure Dispensing Agents	aerosol propellants	Nitrous Oxide

*Source: Statistics Canada

Release Agents	stops food from sticking (Pam)	Calcium Stearate
Whipping Agents	help whip a product	Sodium Steroyl 2 Lactylate
Wetting Agents	for instant beverages	not available
Anti Sprouting Agents	onions and potatoes	not available
Plasticizing Agents	chewing gum	not available
Dusting Agents	Chewing gum	not available

There are 1,500 flavours (3 times the number of other additives). We are often deceived when we find that things are artificially flavoured. This brings awareness to people. Colours are added only to make the food look different. They make you think something will taste cherry but really it tastes the same a grape. If people realize that they are only tasting "sweet" (in the case of candy etc.) they won't be getting ripped off as much.

ACKNOWLEDGEMENTS

We would like to thank all the people who volunteered to assist us with our testing for our science fair project, and Mrs. Portugal for doing the typing.

BIBLIOGRAPHY

Pim, Linda R. Additive Alert

copyright 1979, 116 pages
Doubleday Canada

Pyke , Magnus Synthetic Food

copyright 1970, 145 pages
John Murray Ltd.

Benarde, Melvin A. The Chemicals We Eat

copyright 1971, 208 pages
American Heritage Press