

# STUDENT-WRITTEN ARTICLE USED FOR THINK-ALOUD TASK – EXPLORATIVE STUDY

## APPENDIX A

### **THE PHYSICAL EFFECT OF CHOCOLATE: BLOOD PRESSURE AND PUPIL DIVERGENCE**

#### **Summary**

There are a lot of myths about chocolate. You could get addicted to it and you get a rash of chocolate. This isn't true. There's also a myth that chocolate is an aphrodisiac, this might be true. Another myth; It seems that chocolate lowers your blood pressure, we tested it with white and dark chocolate. With white chocolate your blood pressure doesn't lower but with the dark chocolate it certainly does!

#### **Introduction**

Most people eat chocolate because they like the taste and they get a happy feeling. Some people say that they're addicted to chocolate, that is one of the many mistakes about chocolate. You have to eat thousands of chocolate bars before you get addicted! Because the chocolate con-

tains so little of the substances you get addicted to. Another mistake is that chocolate causes acne, this isn't true. If you get a rash from chocolate you might be allergic! There is also a myth that chocolate is an aphrodisiac, this might be true! Chocolate contains three kinds of substances that can be related to this myth. These three substances are caffeine, theobromine and phenylethylamine. These three substances together will give you extra energy, make your heart beat faster and make you a bit jumpy. So you can see how chocolate could be linked with love.

You see that there are lots of myths about chocolate. Yet another myth is that your blood pressure lowers through eating chocolate, this is the focus of our research. We want to know if there are substances in chocolate that lower your blood pressure. We also want to know if your pupil divergence will change when you eat chocolate.

There're several kinds of chocolate. Dark chocolate has other ingredients and different proportions of ingredients than white chocolate. We measured if there are differences in the lowering of your blood pressure when you eat white chocolate or dark chocolate. We also measured if there are differences in pupil divergence.

White chocolate consist of 33% cocoa, cocoa butter, sugar, milk-powder, sojalecithine and vanillin. ark chocolate consist of at least 54% cocoa, cocoa butter, sugar, sojalecithine and vanillin. There are a few differences in the ingredients of white chocolate and dark chocolate. Will this make a difference to your blood pressure or your pupil divergence? Our research question is:

*Which kind of chocolate has more effect on your blood pressure and pupil divergence? (White chocolate or black chocolate).*

### **Experimental procedure**

#### ***Blood pressure***

We both did the experiment. We had two dark chocolate bars (54% cocoa) and two white chocolate bars (33% cocoa). We had calculated how much chocolate we had to eat every 15 minutes so that the chocolate was well divided. Marlissa ate the white chocolate and Milou ate the black choco-

late. We measured the time when we began to eat, after 15 minutes we measured the blood pressure with a digital blood pressure computer. Of course we also measured the blood pressure before we began to eat the chocolate. We measured the blood pressure after 15 minutes, 30 minutes, 45 minutes etc. After the experiment we worked out the measurements in charts and diagrams. Then we could see what happened to our blood pressure.

#### ***Pupil divergence***

We conducted this experiment together with the blood pressure experiment. We conducted the measurements also every 15 minutes; we used a ruler to measure the size of the pupil. We tried to do the measurements as accurate as possible. We wrote done the measurements. After the experiment we worked out the measurements in charts and diagrams. Then we could see what happened to our pupils.

### Results

We measured the blood pressure of Marlissa several times after she ate the pieces of white chocolate. Chart 1 and diagram 1 show you the results of the systolic pressure (the highest pressure).

Time (min)	The Systolic pressure (mmHg)
0	123
15	138
30	140
45	129
60	149
75	138
90	125
105	124
120	142

Chart 1: *The Systolic pressure, white chocolate.*

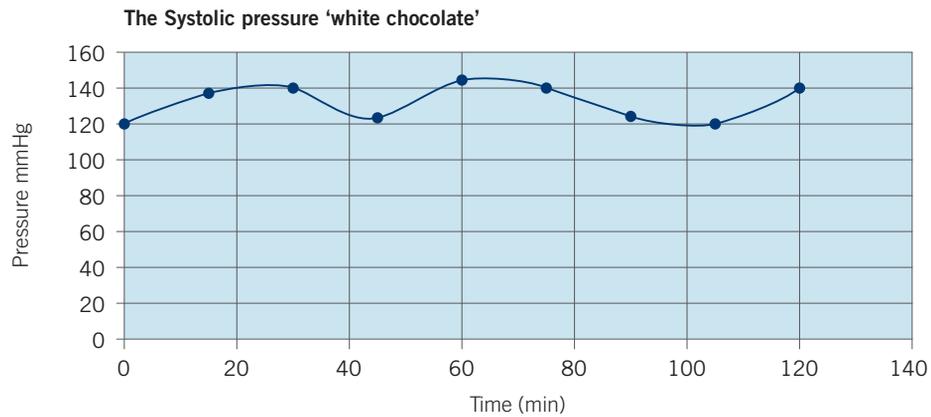


Diagram 1: *The systolic pressure, white chocolate.*

In chart 2 and diagram 2 you can see the results of the diastolic pressure (the lowest). They are shown below.

Time (min)	The Diastolic pressure (mmHg)
0	68
15	85
30	66
45	66
60	88
75	68
90	80
105	59
120	81

Chart 2: *The diastolic pressure, white chocolate.*

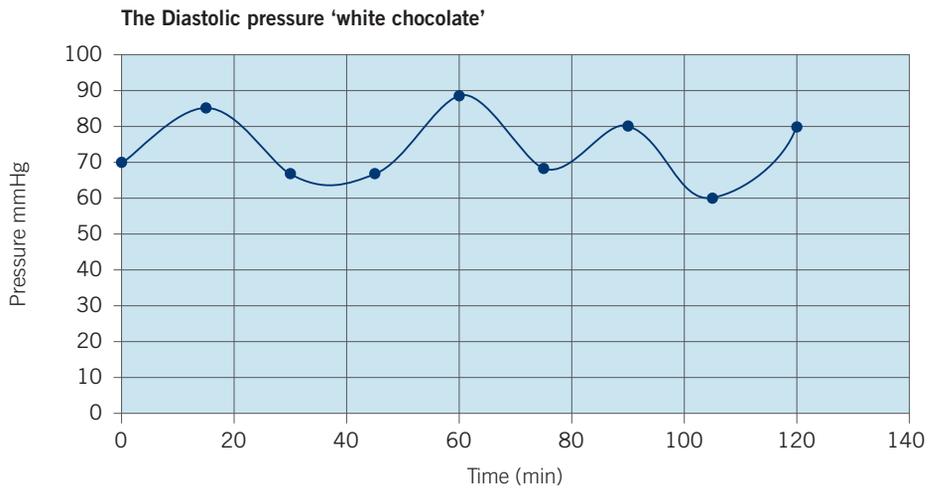


Diagram 2: *The diastolic pressure, white chocolate.*

We also measured the blood pressure of Milou several times after she ate the pieces of dark chocolate. Chart 3 and diagram 3 show you the results of the systolic pressure when you eat dark chocolate.

Time (min)	The Systolic pressure (mmHg)
0	122
15	137
30	130
45	132
60	141
75	135
90	134
105	127
120	119

Chart 3: *The systolic pressure, dark chocolate*

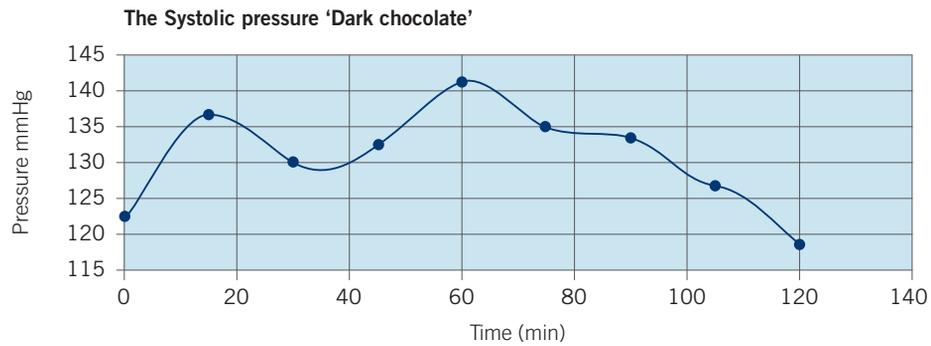


Diagram 3: *The systolic pressure, dark chocolate.*

Chart 4 and diagram 4 present the results of the diastolic pressure when you eat dark chocolate. You can see them below.

Time (min)	The Diastolic pressure (mmHg)
0	58
15	63
30	65
45	64
60	61
75	61
90	59
105	58
120	57

Chart 4: *The diastolic pressure, dark chocolate.*

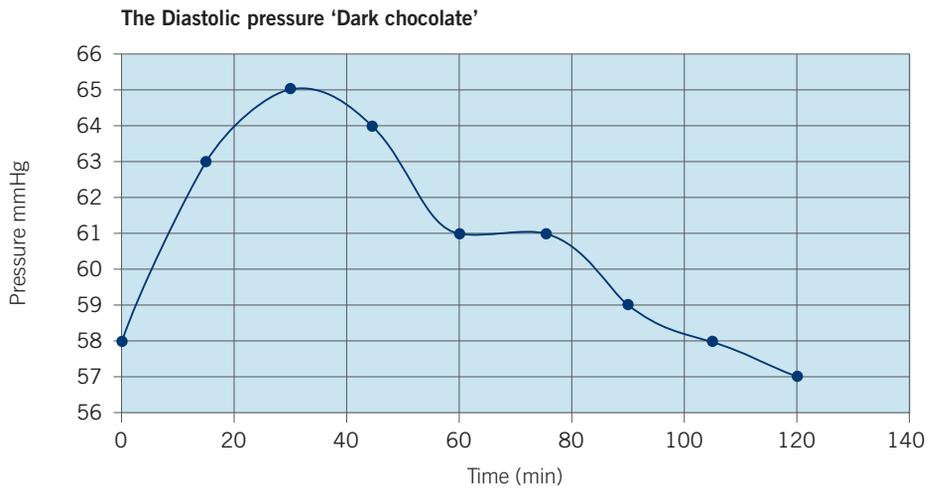


Diagram 4: *The diastolic pressure, dark chocolate.*

After we measured the blood pressure, we also measured the pupil divergence. We measured the pupil divergence when you eat white chocolate and when you eat dark chocolate. Chart 5 shows you the pupil divergence of someone who has eaten white chocolate and chart 6 shows you the pupil divergence of someone who has eaten dark chocolate.

Time (min)	The pupil divergence (mm)
0	0,5
15	0,4
30	0,4
45	0,4
60	0,4
75	0,4
90	0,4
105	0,4
120	0,4

Chart 5: *The pupil divergence, white chocolate.*

Time (min)	The pupil divergence (mm)
0	0,5
15	0,4
30	0,4
45	0,4
60	0,4
75	0,3
90	0,3
105	0,3
120	0,3

Chart 6: *The pupil divergence, dark chocolate.*

### Conclusion and discussion

We compared the four diagrams (1, 2, 3 and 4). You can see that the blood pressure of the person who has eaten white chocolate is going up and down, there are no big deviations in the diagrams. They're almost constant. In the diagrams of someone who has eaten black chocolate, you can see that the blood pressure is going up and down. But at the end the blood pressure is lower than it initially was. We also measured pupil divergence, we have come to the conclusion that our measurements aren't reliable because of the accuracy of our measurements. You have to use more reliable and accurate instruments to measure pupil divergence. Your pupil is so little that you can make a big measurement mistake. The measurements are so close together you can't say if they are mistakes.

### Answering our research question.

From our data we conclude that dark chocolate has more effect on your body than white chocolate. We can only say this about the blood pressure because our measurement of the pupil divergence aren't reliable. We think this is because there's more cocoa in dark chocolate than in white chocolate. Almost all of the ingredients of white and dark chocolate are the same, but there're different in the amounts of cocoa, in white chocolate there's  $\pm 33\%$  cocoa and in dark chocolate there's  $\pm 54\%$  cocoa.



## APPENDIX A

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### **Bibliography**

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2. <http://www.opdieet.nl/chocola.htm>
3. Planet; <http://www.zorgkrant.nl/read.html?id=1199>

