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Improving Medication Leaflets, do Pictograms help?

A research on the use of (colourful) pictograms in medication leaflets

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Abstract

Background: In this research the focus is on the effects of (colourful) pictograms on the understandability of medication leaflets of painkillers. Official instances show that the risks of painkillers are underestimated, one of the main reasons for this is not reading the leaflets.

Aim: One of the solutions provided is a 'leaflet for dummies', where pictograms show the most relevant information of the leaflet. There has been quite some research on the use of pictograms in medical context. This research will elaborate on the effects of using pictograms in medication leaflets, the influence of the use of colour in pictograms, and the preferences of users regarding leaflets with pictograms.

Design: Via an online questionnaire with a 3X1 research design, the effects of colourful pictograms, black and white pictograms, and no pictograms were tested. The differences in information recall scores, attitude (based on leaflet structure, language use, usability, appealingness and accessibility) were based on the responses of 95 respondents. The used analyses are factor analyses and ANOVA-analyses.

Results: The analyses showed no significant results. There is no significant effect of pictograms on the understandability of a medication leaflet. Also the differences between colourful pictograms and black-and-white pictograms were too small to be significant. The leaflet with colourful pictograms was evaluated highest by people that first saw the black-and white pictograms. Nonetheless this result was not significant either.

Conclusions: There are no significant effects of (colourful) pictograms on medication leaflets. Even though there are no significant effects, adding pictograms to medication leaflets is recommended. Using pictograms in medical context is an interesting topic and gives plenty of opportunities for further research.

Keywords: Medication leaflets; Pictograms; Colour use in pictograms; Colour versus black-and-white

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1. Introduction

The Instituut Verantwoord Medicijngebruik (IVM) shared an alarming report in November 2018. The institute, which focusses on creating awareness regarding medication, found in their research that 40% of their respondents did not know that anti-inflammatory medication has (serious) side effects. Only 60% of the respondents mentioned the leaflet as one of the information sources to consult when they have questions regarding painkillers. The institute concludes that it is expected that a way bigger number of people don't read the leaflets since they simply don't know the possible risks.

One of the reasons for this, is the simple availability of painkillers (such as paracetamol, ibuprofen and diclofenac) at supermarkets or drugstores. This leads to buying these drugs without the real need for them (impulse purchases). Next to that, these stores do not provide customers with professional information regarding the mediation. Not having sufficient information, in combination with the easy availability of painkillers could lead to serious health issues. The solutions seems simple: just read the leaflet before using painkillers. But the IVM showed that this does not happen. This thesis will focus on this problem. How can you make people read the leaflets? And do pictograms contribute to a better understandability of the leaflets?

The obvious solution would be to change the leaflets to consumer's preferences. This can be done by changing the text, or changing the layout of the leaflet. There are different organizations that come up with guidelines for medication leaflets, to make sure they are understood by the greatest amount of people. The *European Medicines Agency* has a set of guidelines for all leaflets in Europe. For the Netherlands, there is a special *Regeling Geneesmiddelenwet* focussing on Dutch leaflets. And there are more organizations that focus on leaflets, therefor it can be concluded that all medication leaflets worldwide are more or less the same, as concluded by Dost (2015).

For this research, the focus will be on the layout of the leaflet. Lots of research has been done on the use of pictograms in manuals. Also in medical context. There are different opinions on the use of pictograms in (medication) manuals. For example most positive results were found in research with low-literate participants (Dowse, Ramela and Browne, 2011). On the other hand, no effect was found in research focussing on pictograms while driving (Roca, Insa and Tejero, 2018). No research has been focussing on the use of pictograms in medication leaflets for the general consumer. Therefor this research is theoretically seen relevant.

While writing this rapport a news article appeared in Dutch media (Nieuwenhuis, 2019). The CBG suggests coming with 'leaflets for dummies', as an addition to the current medication leaflets. These simplified leaflets consist of short text and pictograms, to immediately display the most relevant information about the medication. The pictograms in this research would do the same, therefor this research is very topical.

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1.1 Research Question

Quite some research has been done on changing the text or content of leaflets to improve the understandability. The most relevant results of those researches will be presented in the theoretical framework of this rapport. The main research question of this rapport is the following:

Does the presence of (colourful) pictograms improve the understandability of medication leaflets?

Following this research question, some hypotheses can be drawn. In the theoretical frameworks there will be elaborated on these hypotheses. Different insights based on literature will be given with relation to the use of pictograms, the use of colour in those pictograms, and the relevance for pictograms in the medical environment.

2. Theoretical framework

The main research question as presented in the introduction can be divided into multiple components. This chapter will elaborate on these components and will support the subsequent hypotheses with relevant literature.

2.1 Including pictograms in medication leaflets

Where the main research question focusses on the influence of pictograms, it firstly is interesting to see if pictograms do contribute to a better understanding and medication leaflets. There is already research available on this topic, which will be presented below.

Interesting research on the understandability of pictograms has been done by Keil, Edler, Dickman and Kuchinke (2018). They focussed on pictograms of landmarks on orientation maps. The focus in this research was on the relation between salience, meaningfulness and recognition performance. Keil et al. found that visual complexity and meaningfulness of pictograms influence their visual salience and recognition performance. This implies that pictograms need to be meaningful in order to contribute to a better understanding of the pictograms.

Vaillancourt, Pouliot, Streitenberger, Hyland and Thabet (2016) did research on the use of safety pictograms in medication. A group of health care experts determined ten different situations where pictograms could improve safety regarding mediation. Safety pictograms were assigned to different situations. Only in 74% of the respondents were able to determine the right pictograms for the right situations. A more positive opinion on pictograms is given by Montagne (2013). He claims that pictograms are a key component in re-designing medication information, with the purpose to improve comprehension, recall and adherence. Montagne states that it does not really matter what these pictograms look like. As long as pictograms are somehow related to the information they relate to, they improve comprehension. But of course, Montagne concludes, training regarding the pictograms improves their effectiveness over time.

But pictograms do not always contribute to a better understanding of medication information. This is shown by Jackson, Malewicz, Maloney, Marcinek and Cecil (2017). They tested a selection of 20 pictograms from the US Pharmacopeia database, but found that the respondents were not able to assign most of those pictograms to their correct meaning. And there is more research which shows negative results regarding pictograms. Leong, Tam, Xu and Peters (2018) found that pictograms do not significantly contribute to a better ability to correctly fill a pillbox. On the other hand, another interesting result that Leong et al. found, was that 93% of their respondents felt that pictograms should be used on all medication labels. On top of that, 77% of the participants reported that pictograms helped them understanding the medication instructions. It can be

concluded that participants prefer pictograms above text labels, but the research showed that pictograms did not help them to fulfil a medical task in a better way.

Hämeen-Anttila, Kemppainen, Enlund, Bush Patricia and Marja (2003) found that the use of pictograms in medication leaflets improve understandability and ease to read of those leaflets for children in the age from 7 till 13. Without background information the children understood all pictograms, but the pictograms did not increase their understandability of the leaflet itself. Hämeen-Anttila et al. concluded that the usefulness of pictograms in leaflets may be exaggerated. More recent research by Kovacevic, Brozovic and Mozina (2016) shows the opposite. They state that the use of pictograms improve the user experience regarding to search strategy. In their research, the participants were assigned to an eye-tracking research. Including pictograms improved the efficiency of information searching. Therefor it can be challenged if a research from 2003 (Hämeen-Antilla et al., 2003) is still relevant anno 2019. The upcoming internet and smartphones changed a lot in people's behaviour, compared to sixteen years ago. On top of that it can be questioned if medication leaflets should be understandable for thirteen year old children, which Hämeen-Antilla et al. focussed on.

The controversy in literature makes this an interesting case to do research on. It can be challenged if the understandability of the leaflet is influenced by pictograms. On one hand, Jackson et al. (2017) claim that people do not understand the meaning of pictograms, Leong et al. (2018) agree by stating that pictograms do not contribute to a better understanding on how to fill a pillbox. On the other hand, Kovacevic et al. (2016) state that pictograms improve the efficiency of information searching, and Montagne (2013) claiming that pictograms are essential for redesigning medication leaflets. Because of the conviction in the last two mentioned articles, the following hypothesis can be drawn.

H1: Pictograms improve the understandability of medication leaflets.

2.2 The use of colour in pictograms

Pictograms come in all forms and shapes. Pictograms and icons are used for a wide variety of products. Hsieh (2017) focussed on commercial icons, icons used for practical settings. In his article he concludes that colour is identified as an important attribute in the process of sorting icons, even more important than for example the shape, complexity or pictorial style of the icon. Furthermore Hsieh concludes that colour is closely related to visual attractiveness, but less relevant to conveyance of meaning. Because colour is related to attractiveness, colourful icons also improve the speed at which the icons are recognized. Concluding it can be said that colour has big a huge influence on icons.

Kovacevic, Brozovic, and Mozina (2018) conclude that besides colour, also the size and thickness of lines in a pictogram contribute to attractiveness. Larger pictograms with thicker lines attract more attention. Kovacevic et al. add that if a pictogram attracts attention well, this contributes to an improved level of efficient safety message transmission. Yamazaki and Taki (2010) showed that pictograms including and object and an action are better comprehended than ones including only an action without an object.

Coming back to the use of colours, Zhu, Yu, Wang and Li (2013) state that colour influences understandability of visual elements. Colour in a pictogram is used as an attention cue and the shape of this pictogram is used as a descriptor cue, according to Zhu et al. A combination of colours does improve the recognition rate, as long as the used colours do not match with background colours. Unfortunately Zhu et al. do not tell which colour combinations work best. Many research has been done on people's expectations regarding colours. Schoormans (1997) states that colour increases retain attention, which enables cognitive information processing. Kauppinen-Räisänen (2014) claims that the colour green is related to health. In addition to the value of colours, Meier, D'Agostino, Elliot, Maier and Wilkowski (2012) state that the colour red is related to danger. In the research of Hiranchiracheep, Yamazaki, and Foypikul (2016) it was shown that red pictograms work best, and white pictograms work worst. For high schooled people the colour green works best for pictograms.

Liu, Chiu, Lin and Chiou (2014) focussed on the difference between black-and-white pictograms, coloured sketch pictograms and full colour picture pictograms. The pictograms represented different dishes in a research on dietary information. Comprehension is improved with using colour drawings instead of black-and-white drawings (Liu et al., 2014). There were some specific pictograms (specific dishes) where colour did not influence the understandability, but overall, colour worked better than black-and-white pictograms. Furthermore, Liu et al. conclude that there is little to no difference in understandability of coloured sketch pictograms and full colour picture pictograms.

All information above emphasizes the relevance of colour in pictograms. Zhu et al. (2013) state that colour improves the understandability of pictograms. Hsieh (2017) agrees, and states that colour is the most important element of a pictogram. Less research has been done on the comparison between colourful pictograms and black-and-white pictograms, but Liu et al. (2014) state that in general colour worked better than black and white pictograms. As a result of the presented literature, the following hypothesis can be drawn.

H2: Full colour pictograms are understood better than black-and-white-pictograms.

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2.3 Preference of pictograms

Besides the unconscious effects of pictograms, it is alto interesting to look at people's preferences regarding pictograms. Previous chapters showed that it is assumable that colour influences the understandability of pictograms, and that pictograms influences the understandability of a medication leaflet. To focus more on the preferences, some research is presented regarding peoples preferences towards pictograms in leaflets. Roca, Insa and Tejero (2018) show in their research on pictograms on variable-message signs (above roads for example) that people prefer text above pictograms. When in a car, one has very limited time to understand a message. Here, one-word messages performed better than pictograms.

Leong, Tam, Xu, and Peters (2018) highlight the importance of pictograms for people with poor literacy. Here, the respondents preferred pictograms over text in instructions to correctly fill a pill-box. Van Beusekom, Grootens-Wiegers, Bos, Guchelaar and van den Broek (2016) came up with comparable results. They focussed on adding images to drug information, to make low-literate patients understand these better. Because the difficulty of written information, low-literate patients went searching for better understandable information sources, or did not read this information at all. Van Beusekom et al. conclude that a combination of a visual and textual approach is more likely to match the preferences of low-literacy people, and that this is what the participants mentioned themselves as well.

Dowse, Ramela and Browne (2011) did a lot of research on using pictograms and peoples preferences. Most of this research focused on low-literate people, for example on a medicine information leaflet for HIV/AIDS patients. Dowse et al. found that a combination of text and pictograms improved understandability, when those were closely related to one another. This is in line with earlier research by Houts, Doak, Doak and Loscalzo (2006). They found that pictures closely related to written text were understood better than this text alone. In 2005, Dowse and Ehlers found that pictograms on medicine labels positively influenced both understanding of those instructions and on adherence. Also in this research, literacy level influenced these results. Forty five percent of the respondents claimed they had an increased level of understanding, even though they were unable to read the text due low-literacy. This shows people's preference for pictograms.

Literature does not show the attitudes of general people towards pictograms in leaflets. The focus is mostly on the effects and preferences of low-literate people. Dowse and Ehlers found results for low-literate people in 2005, and more recent, Leong et al. (2018) found comparable results. Houts et al. (2006) states that a good combination of pictograms and text improves the overall appreciation of the text. Based on the literature available, the following hypothesis could be drawn.

H3. People prefer a combination of text and pictograms above text only.

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2.4 Preview of the study

The three afore mentioned hypotheses focus on the use of (colourful) pictograms in medication leaflets. In order to test the hypotheses, different variables will be used. To test H1, the focus will lay on the variable *Information Recall*. It is expected that the inclusion of pictograms to the leaflet will increase the information recall of the content of the leaflet. To test H2, the focus will lay on the variable *Attitude*. This variable consists of five different constructs, namely *Structure, Language use, Usability, Appealingness* and *Accessibility.* It is expected that the leaflets with pictograms score higher than the leaflet without pictograms, and that the leaflets with colourful pictograms score higher than the leaflet with black-and-white pictograms. Lastly, to test H3, the focus will lay on the variable *Preference*. It is expected that the leaflet with colourful pictograms is rated high, and there for preferred above the leaflet with black-and-white pictograms, or without pictograms. The variables and hypotheses can be visualized in a research model, which is presented in figure 1.

H1: Pictograms improve the understandability of medication leaflets.

H2: Full colour pictograms are understood better than black-and-white-pictograms.

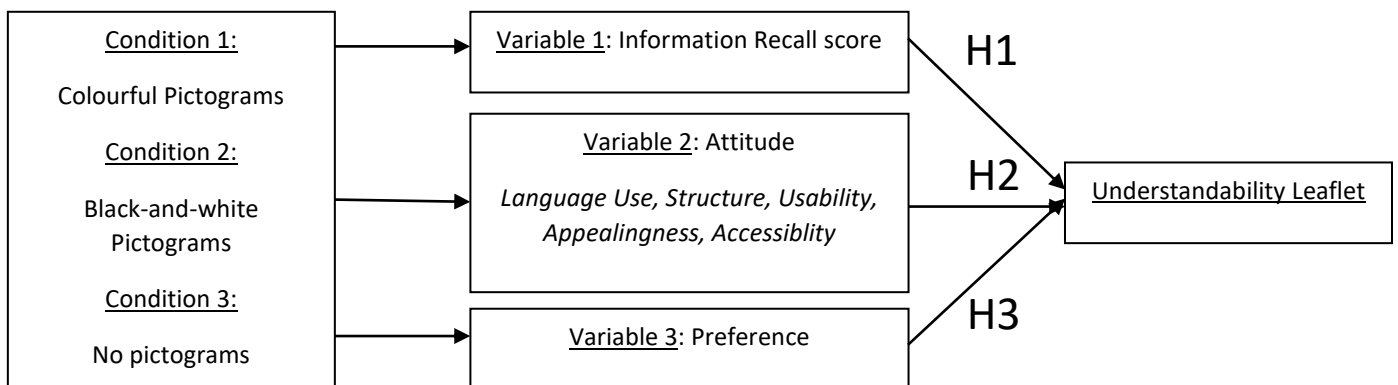H3. People prefer a combination of text and pictograms above text only.

Figure 1: Research model

3. Methods

There are three different conditions in this research. Condition 1 has colourful pictograms included in the leaflet. Condition 2 has black-and-white pictograms included in the leaflet, and condition 3 has no pictograms included. These three factors contribute to the overall understandability of the medication leaflet. The understandability is measured by the variables information recall, attitude and preference. The experiment used a 3x1 between-groups design. In this chapter, all aspects regarding the experiment are explained.

3.1 Choice of Presentation Mode

The general trend is that manuals are more and more taking a digital, on-screen form, but paper manuals are still the most popular method of communicating medication instructions (Kovacevic, Brozovic & Mozina, 2015). In this research, the medication leaflet was shown digitally. There are several differences of presenting the stimulus materials on paper or digitally. The displaying device differs among the different participants. Next to that, it is easier to navigate through a paper multi-page leaflet than doing this digitally. Because the medication leaflet for paracetamol is a one-paper document, the influence is minimal. Nevertheless, much effort has been put into making the digital version as similar as possible to a paper version, although perfect equivalence is not possible (Noyes & Garland, 2008). Since Qualtrics does not offer the opportunity to zoom in a graphic element, the two columns of the leaflet are displayed below one another.

Going more in dept regarding the displaying device, the biggest difference will be between PC users and mobile device users. A PC screen gives a better overview of the document than a mobile phone screen. Because of this, it is important that all users have access to a clear and readable leaflet. On the other hand, since most participants are from the younger generation, they are very familiar with reading from (small) screens. The way the leaflet and the following questions are presented in this research is for both

3.2 Participants

A total of 95 people participated in this study (N=95). They were more or less equally divided among the conditions. This division, and further demographic details, can be found in table 1. Most respondents were students of the University of Twente, who voluntarily participated in this research. The material and questionnaire were presented in Dutch, this excluded international students. The survey was distributed in the personal environment of the researcher, and as a result the total sample also includes older people from over the Netherlands. The division of participants is visible in table 1.

Condition 3 (no pictograms) was filled in by most respondents (N=38), followed by condition 1 (colourful pictograms; N=31) and condition 2 (black-white pictograms; N=26). The differences in this deviation is caused by the high amount of people that did not fill in the questionnaire completely. This concerns 45 people. The division of unfinished questionnaires can be found in table 1. Furthermore the questionnaire was filled in by people of different age groups and different levels of education. Age differs from 18 till 66 years old, the average ages per condition are included as well. The level of education shows a peak at WO, these are probably all students at the University of Twente.

Table 1
Demographics of the respondents

Factor	Total Sample (N=95)	Colourfull (N=31)	Black-White (N=26)	No pictograms (N=38)
Complete	95	31	26	39
Incomplete	45	16	21	7
Gender				
Male	59	21	16	22
Female	35	10	10	15
Other	1	0	0	1
Age				
Means (S.D.)	31,05 (12,92)	29,70 (12,45)	33,12(14,05)	30,71 (12,65)
18-25	55	20	14	21
26-49	23	5	6	12
50+	16	5	6	5
Education				
Havo	4	3	0	1
Vwo	6	2	3	1
MBO	22	5	6	11
HBO	14	4	6	4
WO	46	17	10	19
Other	3	0	1	2

3.3 Materials: Pictograms

As mentioned before, there are three different conditions of the stimulus material. One leaflet does not include any pictograms, one includes pictograms in black-and-white, and one includes pictograms in full-colour. The pictograms that will be used were designed especially for this study, but are based on the USP pictograms. These pictograms are used in multiple other pictogram-related research, for example by Hämeen-Anttila et al. (2003). In order to have the pictograms suitable for black-and-white as well, an indicator has been added. This indicator shows whether the pictogram reflect an

approval, a question or an advice against the act it reflects. In the colourful pictograms, this effect will be strengthened by giving the pictograms a specific colour per indicator.

The pictograms focused on the risks of using the medication, on when not to use the medication, and how this medication can be used in combination with alcohol or pregnancy. A total of 13 pictograms were designed. Some pictograms are displayed in image 2. In Appendix 2 all pictograms and the text they refer to can be found.

Figure 2: Examples of the pictograms

3.3.1 Preliminary test

In order to make sure the understandability of the pictograms does not contribute to the overall understanding of the leaflets, a preliminary test is conducted. In this test, the pictograms had to be assigned to the information they represent. In the preliminary test, all different pictograms and all different information is given, and the respondent has to connect the right pictogram to the right information. Both the pictograms and the text had been printed out, and that made it easier to connect them to one another.

The preliminary test has been conducted by ten participants (N=10). A combination of black-and-white and full-colour pictures were presented to the participants, in a way that in the end both the black-and-white and full-colour pictograms are all tested five times. The results of the preliminary test can be found in appendix 3. All ten participants managed to connect all pictograms to the right piece of text. It can be concluded that both the black-and-white and colourful pictograms give a good representation of the text they refer to. No bias could occur due people not understanding the pictograms.

3.4. Materials: Text

For this research, the pictograms should influence the understandability of the text. Therefor the focus is on the pictograms. Of course this does not mean that the content and layout of the text should be forgotten. Lonsdale, Dyson and Reynolds (2006) concluded that text layout affects searching performance, so it is very important to think about this beforehand.

A medication leaflet has a typical layout. As mentioned in the theoretical section, this layout is in line with the guidelines of the European Medicines Agency, Regeling Geneesmiddelenwet and

the College ter Beoordeling van Geneesmiddelen. The leaflet that is used in this study was changed a little bit, in order to make it best suitable for a digital study. Akhmadeeva, Tukhvatullin and Veytsman (2012) recommend using a sans serif font for screen presentation. Hagiv and Ng (2007) recommend font size 12 or 14 for comfortable reading. Because the big amount of text in a leaflet, font size 12 will be used in the leaflet. Spacing will be one-point-fifteen, since this is suggested by Camnalbur and Mutlu (2011).

The biggest change regarding the original leaflet, is that the two sides will be displayed in one. Most leaflets have a two-column layout and are printed on both sides of the paper. In order to improve the overview of the digital version, the entire leaflet was displayed in a one-column layout.

Regarding the content of the leaflet, a part of the exact same text of the leaflet of Kruidvat Paracetamol will be used. This leaflet contains all information that is required when using paracetamol, and is approved by the official instances. The text is clear, well-written and free of writing errors. The text that has been used in the stimulus leaflet can be found in appendix 4. In the text, the word 'Kruidvat' is removed.

3.5 Measures

The questionnaire consists of different scales from different researches. The scales will be elaborated on below. All sections and scales are based on other similar research, and scored high reliability values for Cronbach's Alpha. The questionnaire was designed in Qualtrics in University of Twente layout. The complete questionnaire can be found in appendix 6. The three different conditions that were used, will be displayed in appendix 5.

The questionnaire can be divided in several parts. The first part of the questionnaire focuses on information recall. Those questions are based on some of the questions that Al Aqeel (2012) uses in his research on medication package inserts. A selection of 9 of those questions were used, since not all of the questions related to the piece of text of the leaflet. Some examples of questions that were used are: *Je mag dit medicijn gebruiken in combinatie met alcohol?* and *De handleiding geeft informatie over de gevolgen van dit medicijn in geval van zwangerschap en het geven van borstvoeding?* In the research of Al Aqeel, it turned out that information regarding pregnant women is recalled best. This is interesting, and therefor this is included in this part of the questionnaire as well. Furthermore there is asked if the respondents saw something about a table of content, the combination with other medication and alcohol usage.

The next series of questions in the questionnaire focusses on the attitude towards the leaflet that was presented. These used questions are derived from an article by Li, De Jong and Karreman

(2015). Using a five-point Likert scale, a total of twenty-five statements had to be valued. Examples are: *De handleiding is handig voor het uitvoeren van taken* and *De handleiding is gebruiksvriendelijk.* Out of these statements, three constructs were defined. These are *instructions usability*, *structure* and *language use*. After running a reliability test on the three constructs, the following results became clear. Construct 1, the leaflets structure, scores a Cronbach's Alpha of 0,898 out of 8 items. Construct 2, the leaflets language use, scores a Cronbach's Alpha of 0,852 out of 3 items. Construct 3, the leaflets usability, scores a Cronbach's Alpha of 0,808 out of 4 items. For the questionnaire, there was decided to include all original items, in order to determine those constructs. The factor analysis with all items included will be discussed at chapter 4.2.1.

The second part of the attitude measurements focus on two constructs, as determined by Kamalski (2007). These two constructs are *Appealingness* and *Accessibility.* Kamalski determined five items per construct, with a high value of Cronbach's Alpha. Some examples of those items are *Leesbaar – Niet leesbaar* and *Geloofwaardig – Ongeloofwaardig.* Because of the high reliability scores, there was decided to include those two constructs in the research, in the way they were determined by Kamalski. Where the constructs of Li et al. (2015) focus more on aspects of the leaflet, these two constructs elaborate more on overall attitudes. The two constructs scored high reliability values for Cronbach's Alpha. The construct *Appealingness* scores a Cronbach's Alpha of 0,872 with six items. For the construct *Accessibility*, the resulting four items score a Cronbach's Alpha of 0,759.

After being exposed to the full-colour pictograms, some final questions about this leaflet are asked. Fierro, Gómez-Talegón and Alvarez (2013) did research on people's attitudes towards the use of pictograms on medication packaging. They used five questions to determine people's attitude. These questions had a Cronbach's alpha of 0.837 on a 10-point Likert scale. The questions asked for people's attitude towards usefulness, informativeness, comprehensibility and simplicity. Lastly a general evaluation question is asked.

3.6 Procedure
The participant opened the questionnaire by clicking on a personalized link. The first thing they saw was an explanation of the research. The participants were asked if they wanted to participate in this research. Only when accepting this, the questionnaire started. A new screen appeared where one of the three different leaflets was shown. The participant was asked to closely study the leaflet, because some questions about its content were about to be asked. The participant determined himself how long it would take to finish reading. After being finished with the reading, a set of questions was presented about the content of the leaflet. Here, the recall of information was measured. After those questions, a set of questions regarding the leaflet itself were asked. These

focussed amongst others on the layout and readability of the leaflet. All questions needed a response, in order to continue to the next series of questions.

After the questions regarding one of the three shown leaflets, the leaflet with colourful pictograms was presented. One was asked to have a quick look at this leaflet, before having to answer the final set of questions. When those questions were answered, the questionnaire was finished. It roughly took five minutes to finish the questionnaire. There was no reward for filing in the questionnaire.

4. Results

The results are presented in the order of the hypotheses. The first section presents information regarding the recall of information. The second section provides insights in people's attitudes towards the leaflet they were assigned to. This section consists of two parts. In the first part, constructs will be shaped using a factor analysis. In the second part, the constructs are already clear (appealingness and accessibility). These will be tested using a factor analysis with reliability test. In the last part, peoples preferences regarding pictograms will be elaborated on.

4.1 Recall of Information

In the questionnaire, a total of 9 different questions were asked to measure the recall of information in the leaflet. The recall score has been prepared through adding up all correct answers. A factor analysis showed four different components, but because these components only consisted out of one or two items, there was decided to include all nine items. As a result, a recall-score between 0 and 9 was possible, in the end the scores differed between 3 and 9.

An analysis of variance presents the differences of information recall between the different conditions. For recall of information, no effects were found in any of the conditions ($F(2, 92) = 0,366$, p=0,694).Table 2 shows the average scores of recall for the three conditions. Also the standard deviation is included.

Tabel 2
Results Recall scores

	Total sample (N=95)	Condition 1 Colourfull (N=31)	Condition 2 Black-White (N=26)	Condition 3 No Pictograms (N=38)
Recall score	6.39 (1.13)	6.42 (0.96)	6.23 (1,24)	6.47 (1.20)

4.2 Attitudes

The attitude of the respondent has been measured with two different sets of questions in the questionnaire. Per question in the questionnaire, a factor analysis was done to define which items represent which construct. The items in the first question were the same as Li, Karreman and de Jong (2015) used. It is interesting to see if the factor analysis comes to the same constructs. A factor analysis with Varimax rotation was conducted in order to define those constructs. For the second question, a factor analysis with Varimax rotation was used to see if the two constructs that were intended to measure became visible. The results of those factor analysis are shown in table 3 and table 4. After the factor analysis, for both sets of items a variation analysis was conducted to see if

the attitudes differ between the conditions. The results of those two factor analyses can be found in table 5 and 6.

4.2.1. Defining constructs: Language use, structure, usability

A factor analysis with Varimax rotation was used to determine the underlying constructs in the set of items. SPSS showed an amount of five different constructs. These five constructs all had an eigenvalue above one, and explained 64% of all variance. The value for the KMO sample adequacy is 0,863, which is relatively high. The level of significance, following Bartlett's test of sphericity, is smaller than 0,001. By excluding the values smaller than 0,3, and sorting the values from high to low, a clearer view of the underlying constructs became clear.

To define the final constructs, not all items were used. Several items scored low, or were representing multiple constructs. For construct 1, items 7 till 13 and item 22 (where Q13 and Q22 are reversed) were used. For construct 2, only items 16, 17 and 18 were used. For construct 3, all four items (items 1 till 4) were used. The items that were assigned to construct 4 and 5 were removed, since these would lead to constructs consisting of only one or two items. As a result, the first construct consists of 8 items, the second construct consists of 3 items, and the third construct consists of 4 items, as displayed in table 3. Construct one measures the *Leaflets structure*, construct wo measures the *Leaflets language use*, and construct 3 measures the *Leaflets usability*. How this relates to the constructs and items that Li, Karreman and de Jong (2015) used, is discussed at the discussion chapter.

Table 3
Factor Analysis with Varimax Rotation

	Component 1	Component 2	Component 3
Q11	0.788		
Q22	0.744		
Q13	0.724		
Q8	0.718	0.377	
Q10	0.715	0.369	
Q12	0.668		0.442
Q7	0.648	0.415	
Q9	0.610		
Q3		0.723	
Q2		0.716	0.373
Q1		0.700	
Q4	0.394	0.689	
Q17			0.822
Q18			0.815
Q16		0.320	0.814

The three defined constructs are used in a variance analysis. With this analysis, differences in the structure, language use and usability in the different conditions became clear. Table 4 gives the average results of respondents attitudes towards all three conditions. Leaflets structure does not show a significant effect between the conditions ($F_{(2,92)}=0,102$, $p=0,903$). Leaflets language use does not show a significant effect between the conditions ($F_{(2,92)}=0,87$, $p=0,917$). And finally, leaflets usability does not show a significant effect between the conditions ($F_{(2,92)}=0,475$, $p=0,623$). Since there are no significant results, a post hoc test is not relevant. From these results, there can be concluded that the scores for leaflets structure, language use and usability are not significantly influenced by the different conditions. There is no significant conclusion that (colourful) pictograms influence people's attitudes towards leaflets structure, language use and usability.

Table 4

Results respondents attitude scores

	Total sample (N=95)	Condition 1 (N=31)	Condition 2 (N=26)	Condition 3 (N=38)
Leaflets structure	3.79 (0.67)	3.77 (0.66)	3.84 (0.72)	3.76 (0.66)
Leaflets language use	3.44 (0.75)	3.48 (0.75)	3.45 (0.78)	3.41 (0.76)
Leaflets usability	3.86 (0.60)	3.82 (0.58)	3.98 (0.52)	3.83 (0.68)

4.3.2 Check constructs: Appealingness & Accesibility

Two other constructs were used to measure respondent's attitude towards the leaflet they were assigned to. These are appealingness and accessibility. Both constructs were intendedly measured with five items each. These items were clearly assigned to the constructs, as described by Kamalski (2007) Surprisingly, the factor analysis with Varimax rotation shows another division of the items. The results of this factor analysis are displayed in table 5. In table 6, the results of the variance analysis are displayed.

Table 5 gives the results of the factor analysis. Item 9, measuring the coherence of the leaflet, surprisingly was included in the construct *Appealingness*. This results in having six items measuring this construct. The construct scores a Cronbach's Alpha of 0,872 with six items. Removing question 9 would result in a lower value of Cronbach's Alpha. For the construct *Accessibility*, the resulting four items score a Cronbach's Alpha of 0,759. For determining this Cronbach's Alpha, question 8 was rescaled. For both constructs, an average score was calculated. This score was used in the variance analysis, which is displayed in table 7.

Table 5

Factor Analysis with Varimax Rotation

	Component 1: Appealingness	Component 2: Accessibility
Q4 Professional	0.845	
Q3 Credible	0.823	
Q5 Reliable	0.815	
Q9 Coherent	0.729	
Q1 Clear	0.680	-0.473
Q2 Readable	0.613	-0.483
Q6 Difficult		0.867
Q7 Effortful		0.823
Q8 Simple		0.632
Q10 Halting	-0.326	0.630

Table 6

Results respondents Appealingness and Accessibility scores

	Total sample (N=95)	Condition 1 (N=31)	Condition 2 (N=26)	Condition 3 (N=38)
Leaflets Appealingness	2.75 (0.96)	2.74 (0.88)	2.56 (0.98)	2.90 (1.01)
Leaflets Accessibility	4.99 (1.12)	4.94 (1.10)	4.97 (1.06)	5.05 (1.19)

The construct *Appealingness* does not have a significant effect between the conditions ($F_{(2,92)}=0,979$, p=0,379). Also the construct *Accessibility* does not have a significant effect between the conditions ($F_{(2,92)}=0,098$, p=0,906). It can be concluded that using (colourful) pictograms does not influence peoples attitude towards appealingness and accessibility. Leaflets without pictograms score on average slightly higher on appealingness than leaflets with pictograms, but this result is not significant.

4.4 Peoples preferences

The last part of this research focussed on the leaflet with colourful pictograms. Five different questions, on a 10-point Likert scale, were asked to determine peoples appreciation of the colourful leaflet, which was presented to all participants of all conditions. These lead to four specific scores regarding usability, informative value, understandability and ease. Lastly, one overall score is attributed to the colourful leaflet.

In general, the leaflet with colourful pictograms scores was evaluated well. The average scores for all three conditions, and the average score for the total sample are displayed in table 7. Even though the averages sometimes differ quite a lot, analysis of variance does not show significant results between the different conditions. It is interesting to see that people of condition 2, those who were assigned to black and white pictograms first, rate the colourful pictograms on average higher.

Table 7
Average scores peoples preferences

	Total sample (N=95)	Condition 1 Colourful (N=31)	Condition 2 Black-White (N=26)	Condition 3 No pictograms (N=38)
Usability	6.68 (2.66)	6.77 (2.64)	6.69 (2.56)	6.61 (2.81)
Informative Value	6.84 (2.58)	6.87 (2.49)	7.00 (2.53)	6.71 (2.74)
Understandability	7.09 (2.23)	6.52 (2.19)	7.35 (2.30)	7.39 (2.19)
Ease	6.94 (2.38)	6.77 (2.40)	7.31 (2.13)	6.82 (2.56)
Overall score	7.14 (1.89)	7.00 (1.93)	7.58 (1.30)	6.95 (2.18)

5. Discussion and suggestions

In this chapter of the report there will be a review on the hypotheses . Also a short explanation will be given in relation to the theoretical framework. Finally, an answer will be formulated to the general research question. The discussion may provide limitations and shortcomings of this research. These are presented in this chapter as well. From these limitations, some suggestions from future research are derived.

5.1 Main findings

It was expected that pictograms improve the understandability of medication leaflets. Kovacevic et al. (2016) and Montagne (2013) were convinced that there is an effect of pictograms on the understandability of a leaflet. In this research, this effect was measured with nine items which measured the recall of information in the leaflets. Analysis showed that there are no significant effects between the different conditions. Where Jackson et al. (2017) explain this result by stating that people do not know the meaning of pictograms, the pre-liminary test in this research rejects this statement. The ten participants knew perfectly what the pictograms represented. As a conclusion, it can be said that adding pictograms, either colourful or black-and-white, does not influence the information recall of medication leaflets, compared to leaflets without pictograms. The recall score per condition differed too less to be significant. Literature stated that colourful pictograms would work better than black and white pictograms (Hsieh, 2017; Zhu, et al., 2013). Nonetheless the effects of this research are not significant. Therefor it cannot be concluded that colourful pictograms improve the understandability of medication leaflets better than black-and-white pictograms.

Besides information recall, also the attitude towards the leaflet was measured. This was measured via five constructs, namely the leaflets structure, leaflets language use, leaflets usability, leaflets appealingness and leaflets accessibility. Neither of these constructs showed significant differences among the conditions. This was not expected, since for example Houts et al. (2006) stated that pictures strengthen written text. Next to that, multiple researches emphasize the relevance and positive attitude towards pictograms for low-literate people (Dowse et al., 2011; Dowse, and Ehlers, 2005; Leong et al., 2018). This is why a certain effect was expected. The average score per construct per condition differed very little. There for, no significant effects were measured. This result is surprising, since Schoormans (1997) states that colour increases retain attention. It would have made sense if the score on structure and appealingness would have been higher. Besides scoring more or less the same on information recall, people had the same attitudes towards the different leaflets. It was expected that people's attitudes towards a leaflet with colourful pictograms was higher.

Next to people's attitudes, also peoples appreciation towards the colourful pictograms was measured. The leaflet with colourful pictograms was rated with a 7 out of 10. This would imply that people actually do like colourful pictograms in leaflets. Participants who first saw the black-and-white pictograms rated the colourful pictograms highest. This is in line with Liu et al. (2014), who state that comprehension is improved with using colour instead of black-and-white pictograms. Nonetheless the results in this research were not significant.

5.2 Research Question

All previous discussion makes it easier to determine an answer to the main research question. This question is as follows:

Does the presence of (colourful) pictograms improve the understandability of medication leaflets?

The data collected does not show significant results that support the different hypotheses. There for, the main research question cannot be answered with significant evidence. None of the conditions improved the understandability of the leaflet. Neither was there significant proof that people preferred pictograms over no pictograms. No significant differences between colourful and black-and-white pictograms became visible. Based on all previous results and discussions, there can be concluded that there is no significant proof that (colourful) pictograms have an effect on the understandability of medication leaflets.

There are a few limitations that might have contributed to these results. Also some suggestions and recommendations can be drawn from this discussion. The limitations will be discussed in the next paragraph. Thereafter the suggestions and recommendations for further research are presented.

5.3 Limitations and recommendations for further research

As with the majority of studies, the design of this study is subjected to some limitations. Multiple limitations will be given here, in order of relevance.

5.3.1 Sample

The main limitation is the representative sample group. Due to a lot of unfinished questionnaires and time constraints, there was decided to analyse the responses of 95 participants. This may have resulted in no significant results. Next to that, there was a lot of sample bias. The major part of the respondents were young, WO-educated people. When talking about the entire society, this group of people is not as prominent as in the sample of this research. It would have been better to have more

lower-educated people and older people in the sample. Now the results of this research can not be generalized, which is a big limitation.

5.3.2 Stimulus material

The questionnaire also provided some limitations. Most important is the fact that the stimulus leaflets could not be displayed in two columns. This influenced the structure of the leaflet. Qualtrics does not provide possibility to zoom in in a graphic element. There for there was decided to place both columns below one another, in order to keep the text readable. The stimulus leaflet differs a lot from an original leaflet because of this. For future research, it is definitely recommended to have a closer look at the stimulus leaflet.

There are several suggestions for further regarding the stimulus leaflet. In the used leaflet, six of the thirteen pictograms focussed on the navigation through the leaflet. These pictograms were linked to the text of the table of contents for the leaflet. To see if pictograms do influence the overall usability and structure, the entire leaflet text should be used. The setup of the research should change in order to do it like this. Even though this is a long text, it would definitely give other insights. Next to the completeness of the leaflet, the presentation of the leaflet could be changed too. In this research, the stimulus leaflet was presented digitally. It is assumable that a paper-version of the leaflet would lead to different results, since the navigation through paper is different than digital. When presenting the leaflet in real life, an interview would be an appropriate research technique to gain information. Not only would this type of qualitative research lead to more in-dept motivations, it also offers the opportunity to easily reflect on specific parts of the leaflet.

5.3.3 Questionnaire

The questions in the questionnaire were good, the reliability scores for Cronbach's Alpha were relatively high. Still there is a major limitation in the questionnaire. In order to get a clearer view on peoples preferences, it would have been beneficial to literally ask for preferences between non-pictogram and colourful pictogram leaflets. By doing this, the scores of the final questions would get more value. Now, the only result from this part of the questionnaire can be drawn from the average values per condition. This is not sufficient. The purpose of the research was to find out if recall and attitudes differ among the different conditions. This is more a passive way of measuring the differences. It would have been a nice additions if more active comparisons were made. This insight is a recommendation for further research. Focus more on people's attitudes.

The big amount of unfinished questionnaires was a big limitation as well. Many people quit the questionnaire after reading the leaflet. This can have different causes. Option one is that people were scared by the big amount of text in the leaflet. Option two is that people got scared by the list

of questions. A third option is that people did not find a leaflet on paracetamol relevant. To tackle this problem, it is recommended to use another kind of leaflet for further research. Next to the perceived irrelevance, paracetamol is relatively safe to use, without many dangerous side-effects. It would be interesting to see if there are significant results for specific, more dangerous, medicines. On the other hand, users of these kind of medication are very likely to read the leaflet anyways, with or without pictograms. Nonetheless this is an interesting approach. The distinction between people that are dependent on the medication, or who take it occasionally could also be interesting. Literature does not yet provide articles about this.

Another interesting suggestion regarding this topic is the following. The recall of information was measured by asking questions about the content of the leaflet. It may also be interesting to give the participants specific tasks to fulfil with the leaflet. Do pictograms improve the speed of finishing the task successful? And do people mention the pictograms as useful when doing specific tasks? Those are interesting questions to answer with this other kind of research.

5.3.4 Further suggestions
Besides suggestions derived from limitations, some more interesting opportunities regarding this research can be given. The pictograms that were used, are based on the USP pictograms. The pre-test, where the understandability of the used pictograms was tested, showed a 100 percent correct interpretation of the pictograms. Still, it is interesting to use other pictograms. Since the pictograms that were used are quite small and detailed, it might fit better to have more simple pictograms. For further research, it is interesting to have the pictograms tested in a better way, and to provide simple alternatives. Better research on whether or not to use colours in the pictograms would be good as well. This research did not show significant results, but literature did.

6. Practical Implications

This research was not conducted commissioned by an organization. This means that no medication company or official authority is aware of the results. Neither were any of the results significant, so no real conclusions can be drawn, based on this research. Still, some practical recommendations can be given, both on the literature study and the research results.

In the introduction of this rapport a news article about 'leaflets for dummies' was mentioned. This paper, consisting of the most relevant information visualized in a few pictograms, would be an addition to the current information supply for medication. The current medication leaflet, so without pictograms, would still be leading. In this rapport, the aim was to research the influence of pictograms in the leaflets themselves. Unfortunately no significant results became visible. Still this idea of a pictogram-based overview of the most relevant information of the leaflet would be a good addition to the current leaflet. People appreciated the leaflet with colourful pictograms, and literature shows that pictograms do influence people's perception of a leaflet.

It would benefit the medication industry when more people would read the leaflets of medicines. This way, more people are aware of the possible risks that come with certain medication. If pictograms, either in a 'leaflet for dummies' or in the original leaflet, could somewhat contribute to more people reading the information, the implementation of pictograms in leaflets would be a good idea.

Furthermore, pictograms should be used more often in manuals. Pictograms are already used in plenty different ways, but there are still several purposes where pictograms are expected to contribute to a better task-performance. As mentioned before, the participants were able to recognize all pictograms in the preliminary test. Besides that the pictograms were evaluated good in the questionnaire. It is definitely something to implement in more manuals.

7. Conclusion

This research focussed on the effects of (colourful) pictograms on the understandability of medication leaflets. This was done by an online questionnaire, measuring peoples information recall and attitudes towards a leaflet of painkillers. 95 respondents filled in the questionnaire, unfortunately not leading to significant results. The scores on both information recall and the five constructs that measured peoples attitude (structure, language use, usability, appealingness and accessibility), did not variate enough between the conditions to significantly assign those differences to the different conditions. Nonetheless pictograms in leaflets, or other manuals, is an interesting topic and still offers the possibility of much research.

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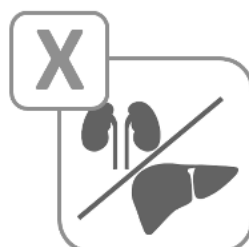
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Appendices

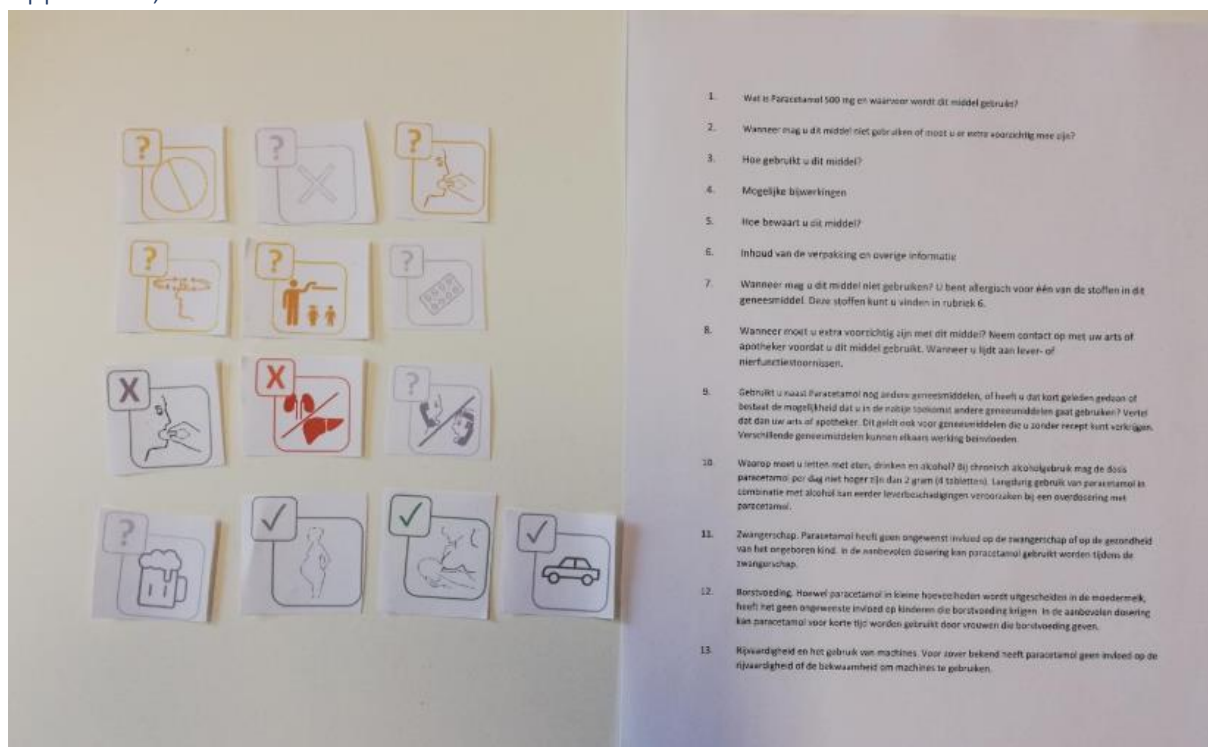## Appendix 1, Pictograms and text

1. Wat is Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?

2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?

3. Hoe gebruikt u dit middel?

4. Mogelijke bijwerkingen

5. Hoe bewaart u dit middel?

6. Inhoud van de verpakking en overige informatie

7. Wanneer mag u dit middel niet gebruiken? U bent allergisch voor één van de stoffen in dit geneesmiddel. Deze stoffen kunt u vinden in rubriek 6.

8. Wanneer moet u extra voorzichtig zijn met dit middel? Neem contact op met uw arts of apotheker voordat u dit middel gebruikt. Wanneer u lijdt aan lever- of nierfunctiestoornissen.

9. Gebruikt u naast Paracetamol nog andere geneesmiddelen, of heeft u dat kort geleden gedaan of bestaat de mogelijkheid dat u in de nabije toekomst andere geneesmiddelen gaat gebruiken? Vertel dat dan uw arts of apotheker. Dit geldt ook voor geneesmiddelen die u zonder recept kunt verkrijgen. Verschillende geneesmiddelen kunnen elkaars werking beïnvloeden.

10. Waarop moet u letten met eten, drinken en alcohol? Bij chronisch alcoholgebruik mag de dosis paracetamol per dag niet hoger zijn dan 2 gram (4 tabletten). Langdurig gebruik van paracetamol in combinatie met alcohol kan eerder leverbeschadigingen veroorzaken bij een overdosering met paracetamol.

11. Zwangerschap. Paracetamol heeft geen ongewenst invloed op de zwangerschap of op de gezondheid van het ongeboren kind. In de aanbevolen dosering kan paracetamol gebruikt worden tijdens de zwangerschap.

12. Borstvoeding. Hoewel paracetamol in kleine hoeveelheden wordt uitgescheiden in de moedermelk, heeft het geen ongewenste invloed op kinderen die borstvoeding krijgen. In de aanbevolen dosering kan paracetamol voor korte tijd worden gebruikt door vrouwen die borstvoeding geven.

13. Rijvaardigheid en het gebruik van machines. Voor zover bekend heeft paracetamol geen invloed op de rijvaardigheid of de bekwaamheid om machines te gebruiken.

1. Wat is Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?

2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?

3. Hoe gebruikt u dit middel?

4. Mogelijke bijwerkingen

5. Hoe bewaart u dit middel?

6. Inhoud van de verpakking en overige informatie

7. Wanneer mag u dit middel niet gebruiken? U bent allergisch voor één van de stoffen in dit geneesmiddel. Deze stoffen kunt u vinden in rubriek 6.

8. Wanneer moet u extra voorzichtig zijn met dit middel? Neem contact op met uw arts of apotheker voordat u dit middel gebruikt. Wanneer u lijdt aan lever- of nierfunctiestoornissen.
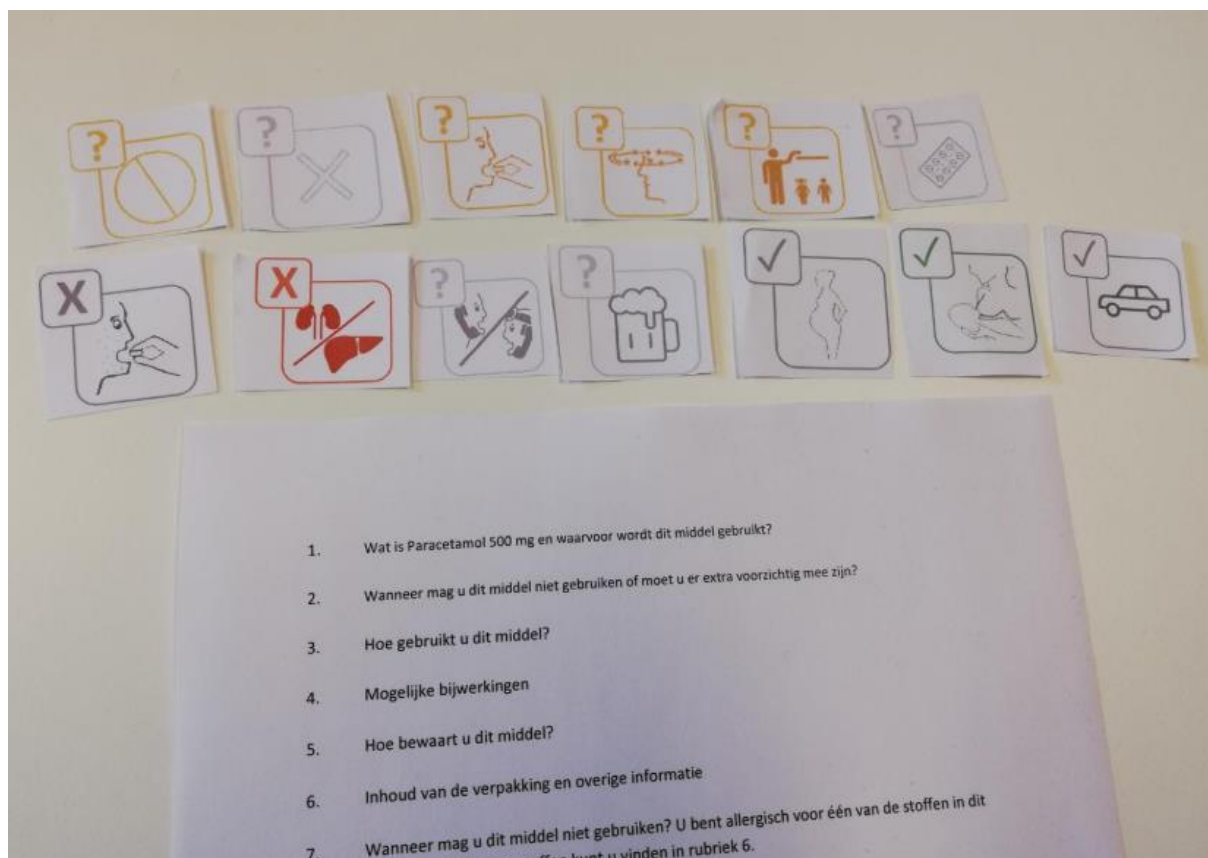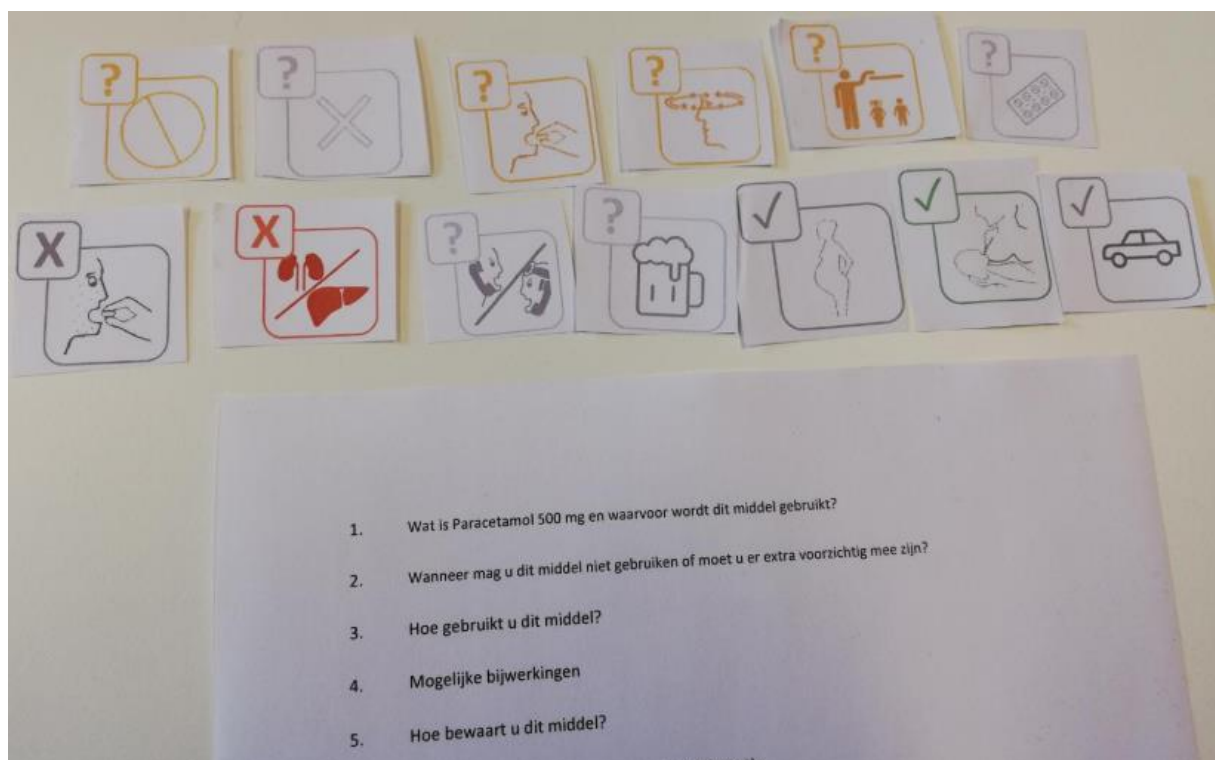
1. Wat is Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?

2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?

3. Hoe gebruikt u dit middel?

4. Mogelijke bijwerkingen

5. Hoe bewaart u dit middel?

6. Inhoud van de verpakking en overige informatie

7. Wanneer mag u dit middel niet gebruiken? U bent allergisch voor één van de stoffen in dit geneesmiddel. Deze stoffen kunt u vinden in rubriek 6.

8. Wanneer moet u extra voorzichtig zijn met dit middel? Neem contact op met uw arts of apotheker voordat u dit middel gebruikt. Wanneer u lijdt aan lever- of nierfunctiestoornissen.

9. Gebruikt u naast Paracetamol nog andere geneesmiddelen, of heeft u dat kort geleden gedaan of bestaat de mogelijkheid dat u in de nabije toekomst andere geneesmiddelen gaat gebruiken? Vertel dat dan uw arts of apotheker. Dit geldt ook voor geneesmiddelen die u zonder recept kunt verkrijgen. Verschillende geneesmiddelen kunnen elkaars werking beïnvloeden.

10. Waarop moet u letten met eten, drinken en alcohol? Bij chronisch alcoholgebruik mag de dosis paracetamol per dag niet hoger zijn dan 2 gram (4 tabletten). Langdurig gebruik van paracetamol in combinatie met alcohol kan eerder leverbeschadigingen veroorzaken bij een overdosering met
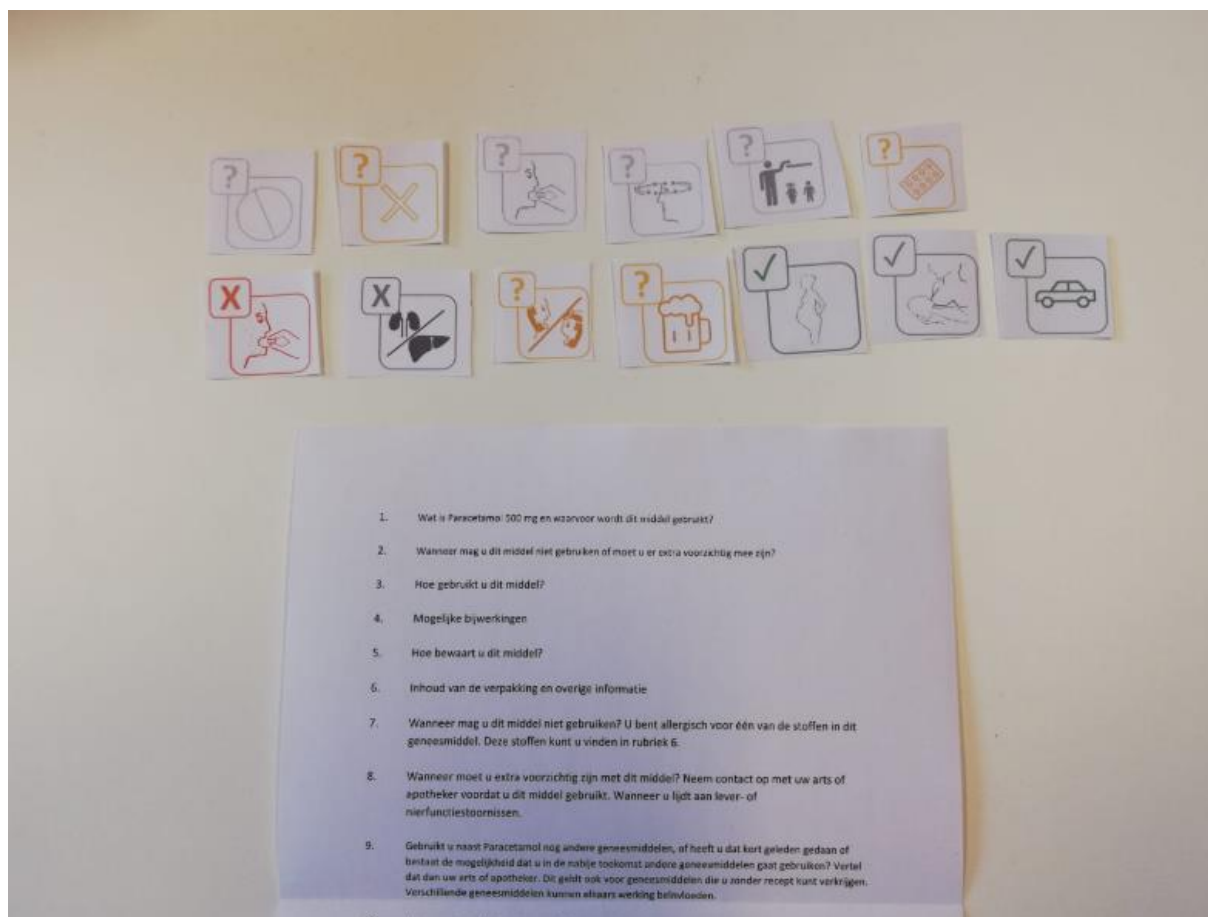

1. Wat is Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?

2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?

3. Hoe gebruikt u dit middel?

4. Mogelijke bijwerkingen

5. Hoe bewaart u dit middel?

... informatie

1. Wat is Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?

2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?

3. Hoe gebruikt u dit middel?

4. Mogelijke bijwerkingen

5. Hoe bewaart u dit middel?

6. Inhoud van de verpakking en overige informatie

7. Wanneer mag u dit middel niet gebruiken? U bent allergisch voor één van de stoffen in geneesmiddel. Deze stoffen kunt u vinden in rubriek 6.

8. Wanneer moet u extra voorzichtig zijn met dit middel? Neem contact op met uw arts apotheker voordat u dit middel gebruikt. Wanneer u lijdt aan lever- of nierfunctiestoornissen.

9. Gebruikt u naast Paracetamol nog andere geneesmiddelen, of heeft u dat kort geleden geda bestaat de mogelijkheid dat u in de nabije toekomst andere geneesmiddelen gaat gebruik dat dan uw arts of apotheker. Dit geldt ook voor geneesmiddelen die u zonder recept kunt Verschillende geneesmiddelen kunnen elkaars werking beïnvloeden.

10. Waarop moet u letten met eten, drinken en alcohol? Bij chronisch alcoholgebruik mag d paracetamol per dag niet hoger zijn dan 2 gram (4 tabletten). Langdurig gebruik van par combinatie met alcohol kan eerder leverbeschadigingen veroorzaken bij een overdose paracetamol.

11. Zwangerschap. Paracetamol heeft geen ongewenst invloed op de zwangerschap of o van het ongeboren kind. In de aanbevolen dosering kan paracetamol gebruikt worde zwangerschap.

12. Borstvoeding. Hoewel paracetamol in kleine hoeveelheden wordt uitgescheiden in heeft het geen ongewenste invloed op kinderen die borstvoeding krijgen. In de aa kan paracetamol voor korte tijd worden gebruikt door vrouwen die borstvoeding

13. Rijvaardigheid en het gebruik van machines. Voor zover bekend heeft paracetam rijvaardigheid of de bekwaamheid om machines te gebruiken.

1. Wat is Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?
2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?
3. Hoe gebruikt u dit middel?
4. Mogelijke bijwerkingen
5. Hoe bewaart u dit middel?
6. Inhoud van de verpakking en overige informatie
7. Wanneer mag u dit middel niet gebruiken? U bent allergisch voor één van de stoffen in dit geneesmiddel. Deze stoffen kunt u vinden in rubriek 6.
8. Wanneer moet u extra voorzichtig zijn met dit middel? Neem contact op met uw arts of apotheker voordat u dit middel gebruikt. Wanneer u lijdt aan lever- of nierfunctiestoornissen.
9. Gebruikt u naast Paracetamol nog andere geneesmiddelen, of heeft u dat kort geleden gedaan of bestaat de mogelijkheid dat u in de nabije toekomst andere geneesmiddelen gaat gebruiken? Vertel dat dan uw arts of apotheker. Dit geldt ook voor geneesmiddelen die u zonder recept kunt verkrijgen. Verschillende geneesmiddelen kunnen elkaars werking beïnvloeden.
10. Waarop moet u letten met eten, drinken en alcohol? Bij chro... paracetamol per dag niet hoger zijn dan 2 gram (4 tabletten... combinatie met alcohol kan eerder leverbeschadigingen ver... paracetamol.
11. Zwangerschap. Paracetamol heeft geen ongewenst invloed... van het ongeboren kind. In de aanbevolen dosering kan pa... zwangerschap.
12. Borstvoeding. Hoewel paracetamol in kleine hoeveelheden... heeft het geen ongewenste invloed op kinderen die borst... kan paracetamol voor korte tijd worden gebruikt door vro...

Inhoud van deze bijsluiter

1. Wat is Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?

2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?

3. Hoe gebruikt u dit middel?

4. Mogelijke bijwerkingen

5. Hoe bewaart u dit middel?

6. Inhoud van de verpakking en overige informatie

1. Wat is Kruidvat Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?

Kruidvat Paracetamol 500 mg behoort tot de groep van de zogenaamde pijnstillende en koortsverlagende
geneesmiddelen.

Kruidvat Paracetamol 500 mg wordt gebruikt bij:
* Hoofdpijn
* Koorts en pijn bij griep en verkoudheid
* Koorts en pijn na vaccinatie
* Kiespijn
* Zenuwpijn
* Spit
* Spierpijn
* Menstruatiepijn

2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?

Wanneer mag u dit middel niet gebruiken?
* U bent allergisch voor één van de stoffen in dit geneesmiddel. Deze stoffen kunt u vinden in rubriek 6.

Wanneer moet u extra voorzichtig zijn met dit middel?
Neem contact op met uw arts of apotheker voordat u dit middel gebruikt.
* Wanneer u lijdt aan lever- of nierfunctiestoornissen

///// Enkele verdere voorbeelden zijn hier bewust weggelaten /////

Gebruikt u nog andere geneesmiddelen?
Gebruikt u naast Paracetamol nog andere geneesmiddelen, of heeft u dat kort geleden gedaan of bestaat

de mogelijkheid dat u in de nabije toekomst andere geneesmiddelen gaat gebruiken? Vertel dat dan uw arts of apotheker.
Dit geldt ook voor geneesmiddelen die u zonder recept kunt verkrijgen. Verschillende geneesmiddelen kunnen elkaars werking beïnvloeden.

Neem contact op met uw arts of apotheker voordat u paracetamol gebruikt, in het geval dat u één van de volgende geneesmiddelen gebruikt:
- Barbituraten (groep van slaap- en verdovingsmiddelen)
- Bepaalde antidepressiva

///// Enkele verdere voorbeelden zijn hier bewust weggelaten /////

Waarop moet u letten met eten, drinken en alcohol?
Bij chronisch alcoholgebruik mag de dosis paracetamol per dag niet hoger zijn dan 2 gram (4 tabletten). Langdurig gebruik van paracetamol in combinatie met alcohol kan eerder leverbeschadigingen veroorzaken bij een overdosering met paracetamol.

Zwangerschap en borstvoeding
Bent u zwanger, denkt u zwanger te zijn, wilt u zwanger worden of geeft u borstvoeding? Neem dan contact op met uw arts of apotheker voordat u dit geneesmiddel gebruikt.

Zwangerschap
Paracetamol heeft geen ongewenst invloed op de zwangerschap of op de gezondheid van het ongeboren kind. In de aanbevolen dosering kan paracetamol gebruikt worden tijdens de zwangerschap.

Borstvoeding
Hoewel paracetamol in kleine hoeveelheden wordt uitgescheiden in de moedermelk, heeft het geen ongewenste invloed op kinderen die borstvoeding krijgen. In de aanbevolen dosering kan paracetamol voor korte tijd worden gebruikt door vrouwen die borstvoeding geven.

Rijvaardigheid en het gebruik van machines
Voor zover bekend heeft paracetamol geen invloed op de rijvaardigheid of de bekwaamheid om machines te gebruiken.

Appendix 4, 3 different conditions leaflet

Inhoud van deze bijsluiter

1. Wat is Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?

2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?

3. Hoe gebruikt u dit middel?

4. Mogelijke bijwerkingen

5. Hoe bewaart u dit middel?

6. Inhoud van de verpakking en overige informatie

1. Wat is Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?
Paracetamol 500 mg behoort tot de groep van de zogenaamde pijnstillende en koortsverlagende geneesmiddelen.

Paracetamol 500 mg wordt gebruikt bij:
- Hoofdpijn
- Koorts en pijn bij griep en verkoudheid
- Koorts en pijn na vaccinatie
- Kiespijn
- Zenuwpijn
- Spit
- Spierpijn
- Menstruatiepijn

2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?

Wanneer mag u dit middel niet gebruiken?
- U bent allergisch voor één van de stoffen in dit geneesmiddel. Deze stoffen kunt u vinden in rubriek 6.

Wanneer moet u extra voorzichtig zijn met dit middel?

Neem contact op met uw arts of apotheker voordat u dit middel gebruikt.

- Wanneer u lijdt aan lever- of nierfunctiestoornissen

///// Enkele verdere voorbeelden zijn hier bewust weggelaten /////

Gebruikt u nog andere geneesmiddelen?

Gebruikt u naast Paracetamol nog andere geneesmiddelen, of heeft u dat kort geleden gedaan of bestaat de mogelijkheid dat u in de nabije toekomst andere geneesmiddelen gaat gebruiken? Vertel dat dan uw arts of apotheker. Dit geldt ook voor geneesmiddelen die u zonder recept kunt verkrijgen. Verschillende geneesmiddelen kunnen elkaars werking beïnvloeden.

Neem contact op met uw arts of apotheker voordat u paracetamol gebruikt, in het geval dat u één van de volgende geneesmiddelen gebruikt:

- Barbituraten (groep van slaap- en verdovingsmiddelen)
- Bepaalde antidepressiva

///// Enkele verdere voorbeelden zijn hier bewust weggelaten /////

Waarop moet u letten met eten, drinken en alcohol?

Bij chronisch alcoholgebruik mag de dosis paracetamol per dag niet hoger zijn dan 2 gram (4 tabletten). Langdurig gebruik van paracetamol in combinatie met alcohol kan eerder leverbeschadigingen veroorzaken bij een overdosering met paracetamol.

Zwangerschap en borstvoeding

Bent u zwanger, denkt u zwanger te zijn, wilt u zwanger worden of geeft u borstvoeding? Neem dan contact op met uw arts of apotheker voordat u dit geneesmiddel gebruikt.

Zwangerschap

Paracetamol heeft geen ongewenst invloed op de zwangerschap of op de gezondheid van het ongeboren kind. In de aanbevolen dosering kan paracetamol gebruikt worden tijdens de zwangerschap.

Borstvoeding

Hoewel paracetamol in kleine hoeveelheden wordt uitgescheiden in de moedermelk, heeft het geen ongewenste invloed op kinderen die borstvoeding krijgen. In de aanbevolen dosering kan paracetamol voor korte tijd worden gebruikt door vrouwen die borstvoeding geven.

Rijvaardigheid en het gebruik van machines

Voor zover bekend heeft paracetamol geen invloed op de rijvaardigheid of de bekwaamheid om machines te gebruiken.

Inhoud van deze bijsluiter

1. Wat is Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?

Paracetamol 500 mg behoort tot de groep van de zogenaamde pijnstillende en koortsverlagende geneesmiddelen.

Paracetamol 500 mg wordt gebruikt bij:
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- Koorts en pijn na vaccinatie
- Kiespijn
- Zenuwpijn
- Spit
- Spierpijn
- Menstruatiepijn

2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?

Wanneer mag u dit middel niet gebruiken?
- U bent allergisch voor één van de stoffen in dit geneesmiddel. Deze stoffen kunt u vinden in rubriek 6.

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Wanneer moet u extra voorzichtig zijn met dit middel?

Neem contact op met uw arts of apotheker voordat u dit middel gebruikt.

- Wanneer u lijdt aan lever- of nierfunctiestoornissen

///// Enkele verdere voorbeelden zijn hier bewust weggelaten /////

Gebruikt u nog andere geneesmiddelen?

Gebruikt u naast Paracetamol nog andere geneesmiddelen, of heeft u dat kort geleden gedaan of bestaat de mogelijkheid dat u in de nabije toekomst andere geneesmiddelen gaat gebruiken? Vertel dat dan uw arts of apotheker. Dit geldt ook voor geneesmiddelen die u zonder recept kunt verkrijgen. Verschillende geneesmiddelen kunnen elkaars werking beïnvloeden.

Neem contact op met uw arts of apotheker voordat u paracetamol gebruikt, in het geval dat u één van de volgende geneesmiddelen gebruikt:

- Barbituraten (groep van slaap- en verdovingsmiddelen)
- Bepaalde antidepressiva

///// Enkele verdere voorbeelden zijn hier bewust weggelaten /////

Waarop moet u letten met eten, drinken en alcohol?

Bij chronisch alcoholgebruik mag de dosis paracetamol per dag niet hoger zijn dan 2 gram (4 tabletten). Langdurig gebruik van paracetamol in combinatie met alcohol kan eerder leverbeschadigingen veroorzaken bij een overdosering met paracetamol.

Zwangerschap en borstvoeding

Bent u zwanger, denkt u zwanger te zijn, wilt u zwanger worden of geeft u borstvoeding? Neem dan contact op met uw arts of apotheker voordat u dit geneesmiddel gebruikt.

Zwangerschap

Paracetamol heeft geen ongewenst invloed op de zwangerschap of op de gezondheid van het ongeboren kind. In de aanbevolen dosering kan paracetamol gebruikt worden tijdens de zwangerschap.

Borstvoeding

Hoewel paracetamol in kleine hoeveelheden wordt uitgescheiden in de moedermelk, heeft het geen ongewenste invloed op kinderen die borstvoeding krijgen. In de aanbevolen dosering kan paracetamol voor korte tijd worden gebruikt door vrouwen die borstvoeding geven.

Rijvaardigheid en het gebruik van machines

Voor zover bekend heeft paracetamol geen invloed op de rijvaardigheid of de bekwaamheid om machines te gebruiken.

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1. Wat is Paracetamol 500 mg en waarvoor wordt dit middel gebruikt?

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3. Hoe gebruikt u dit middel?

4. Mogelijke bijwerkingen

5. Hoe bewaart u dit middel?

6. Inhoud van de verpakking en overige informatie

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- Koorts en pijn na vaccinatie
- Kiespijn
- Zenuwpijn
- Spit
- Spierpijn
- Menstruatiepijn

2. Wanneer mag u dit middel niet gebruiken of moet u er extra voorzichtig mee zijn?

Wanneer mag u dit middel niet gebruiken?
- U bent allergisch voor één van de stoffen in dit geneesmiddel. Deze stoffen kunt u vinden in rubriek 6.

Wanneer moet u extra voorzichtig zijn met dit middel?
Neem contact op met uw arts of apotheker voordat u dit middel gebruikt.
- Wanneer u lijdt aan lever- of nierfunctiestoornissen

///// Enkele verdere voorbeelden zijn hier bewust weggelaten /////

Gebruikt u nog andere geneesmiddelen?
Gebruikt u naast Paracetamol nog andere geneesmiddelen, of heeft u dat kort geleden gedaan of bestaat de mogelijkheid dat u in de nabije toekomst andere geneesmiddelen gaat gebruiken? Vertel dat dan uw arts of apotheker.

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Neem contact op met uw arts of apotheker voordat u paracetamol gebruikt, in het geval dat u één van de volgende geneesmiddelen gebruikt:

- Barbituraten (groep van slaap- en verdovingsmiddelen)
- Bepaalde antidepressiva

///// Enkele verdere voorbeelden zijn hier bewust weggelaten /////

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Bij chronisch alcoholgebruik mag de dosis paracetamol per dag niet hoger zijn dan 2 gram (4 tabletten). Langdurig gebruik van paracetamol in combinatie met alcohol kan eerder leverbeschadigingen veroorzaken bij een overdosering met paracetamol.

Zwangerschap en borstvoeding
Bent u zwanger, denkt u zwanger te zijn, wilt u zwanger worden of geeft u borstvoeding? Neem dan contact op met uw arts of apotheker voordat u dit geneesmiddel gebruikt.

Zwangerschap
Paracetamol heeft geen ongewenst invloed op de zwangerschap of op de gezondheid van het ongeboren kind. In de aanbevolen dosering kan paracetamol gebruikt worden tijdens de zwangerschap.

Borstvoeding
Hoewel paracetamol in kleine hoeveelheden wordt uitgescheiden in de moedermelk, heeft het geen ongewenste invloed op kinderen die borstvoeding krijgen. In de aanbevolen dosering kan paracetamol voor korte tijd worden gebruikt door vrouwen die borstvoeding geven.

Rijvaardigheid en het gebruik van machines
Voor zover bekend heeft paracetamol geen invloed op de rijvaardigheid of de bekwaamheid om machines te gebruiken.

- Algemene introductie + goedkeuring
  - Beste respondent,
  - Hartelijk bedankt voor het deelnemen aan dit onderzoek! Je helpt mij een stukje dichter bij het afronden van mijn bachelor Communication Science te komen!
  - In dit onderzoek zul je een bijsluiter van paracetamol zien. Kijk hier goed naar, want daarna zul je hier wat vragen over moeten beantwoorden en je kan dan niet meer naar de bijsluiter kijken.
  - Ook zal er naar wat demografische gegevens worden gevraagd, zoals je leeftijd, geslacht en opleidingsniveau. Deze gegevens zullen volledig anoniem worden gebruikt in mijn verslag. Dit onderzoek is op geen enkele manier gerelateerd aan een medische organisatie.
    - Ik heb bovenstaande gelezen en ga hiermee akkoord.
  - Om te beginnen met het onderzoek klik je op het pijltje rechts onderin.
  - Nogmaals bedankt! Groeten, Pim Vriens, p.h.j.vriens@student.utwente.nl
- Demografische gegevens
  - Leeftijd
  - Man / Vrouw
  - Opleidingsniveau
- Presentatie manual (een van de 3 condities)
- XX aantal controlevragen voor recall (gebaseerd op Al-Aqeel, 2012)
  - De handleiding geeft een opsomming van informatie die in deze handleiding te vinden is?
  - De handleiding beschrijft de gevolgen van mogelijke allergische reacties?
  - De handleiding geeft aan het medicijn te kunnen gebruiken in combinatie met andere geneesmiddelen?
  - De handleiding geeft meerdere oorzaken om extra voorzichtig te zijn met dit middel?
  - De handleiding geeft informatie over bepaalde voeding in combinatie met het medicijn?
  - Je mag dit medicijn gebruiken in combinatie met alcohol?
  - De handleiding geeft informatie over de gevolgen van dit medicijn in geval van zwangerschap en het geven van borstvoeding?
  - De handleiding geef informatie over een mogelijke beïnvloeding van het medicijn op de reactietijd?
- Waardering vragen over handleiding
    - Li, de Jong, Karreman,
  - Ik ben tevreden met de handleiding
  - De handleiding is van goede kwaliteit
  - De informatie in de handleiding sluit goed op mij aan.
  - De handleiding is handig voor het uitvoeren van taken.
  - De handleiding is gebruiksvriendelijk
  - De handleiding is professioneel vormgegeven
  - Ik kon de informatie die ik zocht, gemakkelijk vinden in de handleiding
  - Het was gemakkelijk om door de handleiding te navigeren
  - Ik raakte de niet verdwaald in de handleiding
  - De informatie is weergegeven op een manier dat het makkelijk te volgen is
  - Het is gemakkelijk om informatie te vinden in de handleiding
  - De inhoud van de handleiding is duidelijk gestructureerd
  - De structuur in de handleiding is verwarrend
  - De tekst van de handleiding is goed leesbaar
  - De handleiding is op een consistente manier georganiseerd

- De schrijfstijl in de handleiding is vloeiend en coherent
- De handleiding heeft een passende toon
- Het taalgebruik in de handleiding is duidelijk
- De tussenkopjes in de handleiding geven duidelijke informatie over de tekst die daaronder volgt.
- Regels in de handleiding zijn ingewikkeld
- De lengte van de regels en alinea's is goed
- De handleiding ziet er druk en ongeorganiseerd uit
- De handleiding bevat nuttige voorbeelden
- De handleiding heeft een aantrekkelijke layout
- De handleiding lijkt op soortgelijke handleidingen die ik eerder heb gelezen.

- Kamalski, 7 punts schaal
  - Aantrekkelijkheid
    - Duidelijk – Onduidelijk
    - Leesbaar – Niet leesbaar
    - Geloofwaardig – Ongeloofwaardig
    - Professioneel – Onprofessioneel
    - Betrouwbaar – Onbetrouwbaar
  - Toegankelijkheid
    - Moeilijk – Gemakkelijk
    - Inspannend – Zonder inspanning
    - Simpel – Complex
    - Coherent – Niet Coherent
    - Haperig - Vloeiend
- Presentatie manual met kleurrijke pictogrammen
- Voorkeur vragen (Fierro, Gomez, Alvarez, 2013)
  - Ik vind de pictogrammen nuttig? 1 – 10
  - Ik vind de pictogrammen informatief? 1 – 10
  - Ik vind de pictogrammen begrijpelijk? 1 – 10
  - Ik vind de pictogrammen eenvoudig? 1 – 10
  - Ik geef de handleiding met pictogrammen het volgende cijfer: 1 – 10

Research Question:
Does the presence of (colourful) pictograms improve the understandability of medication leaflets?

Hypotheses:
- H1: Pictograms improve the understandability of medication leaflets.
- H2: Full colour pictograms are understood better than black-and-white-pictograms.
- H3. People prefer a combination of text and pictograms above text only.

Criteria Preferred Materials:
- Language Dutch or English
- Regency: 2010 – 2019, but preferably the most recent articles
- Online articles, no books
- News-articles / official information regarding pictograms in leaflets

Selected Databases:
- FindUT
- Google (for news articles / official leaflet information)

Literature Research Logbook:

	Datum	Database	Terms	Hits
1	01-04	Google	Regels Medicijn Bijsluiters	65.800
2	01-04	Google	IVM Bijsluiters Nieuws	17.900
3	01-04	FindUT	Pictograms AND leaflets	46
4	01-04	FindUT	Icons AND leaflets	65
5	01-04	FindUT	Pictograms AND manuals	90
6	03-04	FindUT	Pictograms AND colour	35
7	03-04	FindUT	Black and White AND pictogram	15
8	06-04	FindUT	Preference AND Pictograms AND Leaflets	16
9	06-04	FindUT	Pander Maat AND pictogram	0
10	06-04	Google	Pander Maat AND pictogram	2730
11	18-05	FindUT	Design AND medication leaflet	372
12	18-05	FindUT	Design AND text AND Leaflet	484

Examples of Interesting Results:
Some examples of interesting articles, related to the search terms as mentioned in the table above.

3. Dowse, R., & Ehlers, M. (2005). Medicine labels incorporating pictograms: do they influence understanding in adherence? *Patient Education and Counseling, 58*(1), 63-70. doi:10.1016/j.pec.2004.06.012

3. Hämeen-Anttila, K., Kemppainen, K., Enlund, H.,Bush Patricia, J. &, Marja A. (2003). Do pictograms improve children's understanding of medicine leaflet information? *Patient Education and Counseling, 55*(3), 371-378

4. Van Beusekom, M. M., Grootens-Wiegers, P., Bos, M. J. W., Guchelaar, H., & van den Broek, J. M. (2016). Low literacy and written drug information: information-seeking, leaflet evaluation and preferences, and roles for images. *International Journal of Clinical Pharmacy, 38*(6), 1372-1379. doi:10.1007/s11096-016-0376-4

5. Kovačević, D., Brozović, M., & Možina, K. (2016) Improving visual search in instruction manuals using pictograms*, Ergonomics*, *59*(11), 1405-1419, doi:10.1080/00140139.2016.1142123

7. Liu, Y., Chiu, S., Lin, Y., & Chiao, W. K. (2014). Pictogram-based Method of Visualizing Dietary Intake. *Methods Inf Med, 53*(6), 493 – 500. doi:10.3414/ME13-01-0072

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Reflection:
It was relatively easy to find relevant and interesting articles for the theoretical framework. First, I wanted to find information about the problem with medication leaflets. That is why the first searches were on news articles via Google. After determining the problem, the need for scientific articles on pictograms in leaflets determined the searches. Also synonyms for *pictograms* were included, such as *icons*. Many articles came from other articles, and gave additional information about the topic. In the end, no big troubles occurred when searching for articles.