Minimed: Transforming Medication Guidance, Enhancing Understanding for Parents

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ABSTRACT

In the Netherlands, improper medication use is a major concern, standing as the third leading cause of death in the country [5]. Consequently, there is a pressing need for substantial changes in implementing standard practices within the field of medicine. In response, this study focuses on the specific subcategory of reducing knowledge-based medication errors within the target group of parents administering medication to their children in the home environment. Minimed is designed to gather data on the understanding of medication-related instructions through the incorporation of visuals, categorizing information by frequently asked questions, and employing spatial arrangement as opposed to the conventional medication leaflet. Utilizing both qualitative and quantitative research methods, the study aims to gather insights into efficiency, understanding, information recall, as well as underlying perspectives. It had been concluded from the results that the three design elements positively influenced the perception stage of the information understanding process, however, only when implemented according to strict criteria.

Author Keywords

Medication errors; home-patient; pediatric care; design elements; perception; continuum of understanding

INTRODUCTION

The utilization of medication is a fundamental aspect of human existence, with individuals across the globe relying on medicines at various stages of their lives to prevent or address illnesses [2]. As a result, the appropriate use of medications is essential for optimizing individual patient health and the population health for humans as a species [2]. Nonetheless, the positive contributions of medicines can be overshadowed by the potential for serious harm, often manifested through the expression of medication errors [MEs].

According to the World Health Organization, unsafe medication practices and medication errors are a leading cause of injury and avoidable harm in healthcare systems across the world [44]. It is projected that 5% of all patients who are admitted to a hospital will experience a medication error, resulting in possible disability, severe patient harm, or even death [41]. As a consequence, the global economic impact of these errors is estimated to reach $42 billion USD annually based on 2022 measurements, indicating a substantial waste of resources [44]. In response, the WHO acknowledged the severity of this issue in 2017 by launching the third Global Patient Safety Challenge, titled 'Medication Without Harm'. This campaign aimed to reduce severe, avoidable harm from medication-related errors by 50% globally within the next 5 years [44]. One of the objectives outlined in the 'Medication Without Harm' safety challenge is the goal of "raising global awareness of the high burden of education-related harm due to medication errors and unsafe practices, and advocating urgent action to improve medication safety". In response, this study primarily aspires to make a contribution to this objective by significantly increasing awareness of medication errors within the context of individuals engaging with this research [41].

Given the acknowledged impact and significance of medication-related harm on a global scale, this study will focus on a specific geographical area - the Netherlands. An evaluation conducted by the Dutch national government in 2019, known as 'de Rijksoverheid', revealed that approximately 50,000 hospital admissions were recorded due to the improper use of medications in the Netherlands [31]. Consequently, this misuse has led to medication errors being the third cause of death in the country, emphasizing the pressing need for significant changes and targeted actions to tackle this crucial issue [5]. Moreover, the rate of potentially dangerous medication errors among children is reportedly around three times that of adults, making it the most common type of error in pediatric care [46]. Consequently, these findings underscore the urgent need for innovative interventions and a comprehensive understanding of which factors could potentially contribute to the reduction of

medication errors.

As a result, this study seeks to reduce medication errors among the subcategory of parents who are caring for their child in the home environment by enhancing the understanding process of medication information in the Netherlands. To achieve this, the research had a specific focus on three specific design elements, which had been identified through the methodologies of a pressure cooker, third-person-perspective research, ideation, and contact with an expert in the field of pediatric medicine. The ultimate goal of this study is to offer insights that pave the way for future interventions in medication information sources, with the ultimate goal of ensuring the safety of children. During the study, the following research question stood central:

"To what extent does the integration of visual enhancements, alternative categorization, and spatial arrangement of the original medication leaflet, with an emphasis on the '5 Rights', enhance the understanding of medication-related instructions for parents with a medication-requiring child?"

BACKGROUND

Medication errors

In order to conduct research on medication-related harm, it is crucial to initially grasp how this harm manifests itself and explore studies describing its various associated definitions. According to The National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP), medication errors are described as "Any preventable event that may cause or lead to inappropriate medication use or patient harm, while the medication is in the control of the health care professional, patient, or consumer" [26]. Therefore, medication errors are not localized solely to the healthcare sector, such as hospitals or among nurses, but extend to consumers involving themselves in situations without the presence of a medical worker. In order to understand how this exemplifies, it is important to understand the different stages in which medication is involved, and in which medication-related harm can occur.

According to the World Health Organization, MEs happen at any of the following stages and are distributed in one European country; prescribing (21.3%), transcription (1.4%), dispensing (15.9%), administration (54.4%) and monitoring (7.0%) [42]. In addition to these percentages, the European Medicines Agency (EMA) highlighted that the rate of medication errors in European hospitals varies from 0.3% to 9.1% in prescription and from 1.6% to 2.1% at the dispensing stage [42]. Within the scenario of a parent receiving the news that medicine should be distributed to their child at home during a doctor's appointment, the parent operates subsequently on its own during the stages of administration and monitoring [17]. It is during these phases that the parents typically become the primary caregivers responsible for ensuring that the child receives the medication as prescribed and are the only individuals directly responsible for monitoring any potential side effects or adverse reactions. Consequently, these stages have played a primary role during the ideation phase of the research artifact within this study.

Furthermore, according to the research of Aronson et al., who performed an investigation on the definition and classification of medication errors, it is crucial to articulate the stipulative definition of the term, as this clarity is crucial for devising preventive strategies and providing context for discussions on the subject [1]. This approach yields four broad types of medication errors, in which mistakes can be divided into 'knowledge-based errors' and 'rule-based errors', and failures of skill can be divided into 'action-based errors' and 'memory-based errors' (Figure 1) [1]. Building upon the information provided by the WHO, which states that 50–70.2% of medication-related harm can be prevented through comprehensive systematic approaches, a connection had been established between investigating a new manner of a systematic approach within the realm of understanding [42]. According to the stipulative definition provided by Aronson et al., the research presented in this paper can therefore be categorized as generating knowledge with the objective of reducing the amount of medication errors that are arising from the branch of 'knowledge-based errors'.

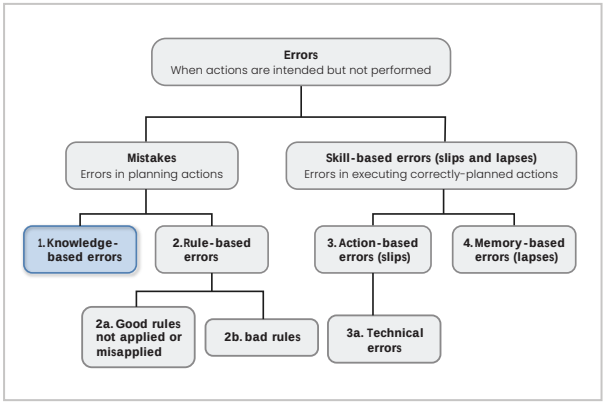

Figure 1. Classification medication errors by Aronson et al. (2009)

Cognitive Analysis of Information Processing

At the initial stage of the study, the cognitive analysis approach was brought forward to scrutinize the elements essential for the process of comprehending information and its interpretation [38]. The analysis involves the assessment of three distinct stages: reception, perception, and apperception, which are collectively labeled as "the cognitive chain of external information analysis" [38]. The individual undergoing these stages is described as using all sensor systems at both the conscious and subconscious levels, making it a complex process [38].

Chronologically addressing the terms, the reception stage can be categorized as the process in which physiological perception and transformation of external stimuli into neural signals takes place, and can therefore be seen as a sensory experience [14]. Secondly, the perception stage includes the process of selecting general and diffuse features of an object, which are subsequently replaced by a more detailed and definite way [38].

Within this second stage, recognition is the central link of perception [38]. Within this recognition link, well-known images are perceived in a fraction of a second, whereas the perception of unknown or little-known objects takes a long time [38]. Lastly, the final stage, known to be apperception, can be thought of as the conscious perception of a known sensory impression, making it the stage where the transition from impression to cognition takes place [38]. Accordingly, during apperception, a new impression is introduced into the circle of already developed concepts and gets its place among them, ultimately enriching our consciousness more and more [38].

Examining this approach from a designer's perspective reveals the potential of generating knowledge on how information is presented and perceived during the second stage: perception, while increasing this right manner of perception can lead to a cumulative enrichment of holistic understanding: apperception.

Visual information processing

The sense of vision plays a dominant role in shaping how individuals perceive and comprehend their surroundings [18]. Given that vision serves as the primary method for acquiring information about the external world, it is arguably the most crucial and intricate sense [18]. As highlighted by A.G. Brown, a professor of Veterinary Physiology, sense organs act as the interface between an individual's internal and external environment and their nervous system [6]. It is therefore important to understand how a human's brain receives, interprets, and acts upon visual stimuli, a process also known as visual information processing [39]. Due to the extensive yet uncompleted research in this domain, certain valid theories have been applied [32].

In the context of this study, the initial foundation was laid upon the research conducted by Thomas Sanocki and Noah Sulman, who conducted an experiment on color relations [34]. It was concluded from this experiment that people remember color patterns better when the color palette is harmonious, and when patterns have fewer colors (two-color palettes) rather than more colors (four-color palettes). Furthermore, the Gestalt principles of human perception, which describe how humans group similar elements, recognize patterns, and simplify complex images when we perceive objects, are utilized within the ideation phase and ultimately find their place within the final design [43]. Due to the Gestalt principle's nature of creating easy-to-understand content, these principles can be considered as the foundation for investigating potential visual information content for parents administrating medication to their child in the home-environment setting [43].

DESIGN PROCESS | ITERATIONS

Pressure Cooker

Understanding the vast amount of challenges that are currently still present in the field of medicine has led to the initial motivation for performing research in this domain. Consequently, at the initial stage of the study, the pressure cooker approach was performed to get a clear image of the field of medicine and explore the potential of performing research in a specific domain (Appendix A). Within the approach, all 5 stages: 'Empathize', 'Define', Ideate, 'Prototype', and 'Test' were carried out, in which key elements could be established and ongoing challenges could be acknowledged.

To approach the domain with a holistic perspective, research from a third-person perspective had been conducted through existing literature, in which an unbiased understanding of all the elements and individuals within the field could be gained. Consequently, the pressure cooker focused on healthcare practitioners, particularly emphasizing nurses due to their responsibility for medication, as well as on individuals in the home-patient setting [32].

Analyzing the results of the pressure cooker led to the insights of firstly, a lack of understanding among home patients; which was based on i.a. the observation of dosing inaccuracies, errors in dosing frequency or duration, administering medication via the wrong route, improper preparation or storage, and the use of expired medications [45]. Therefore, the transition from 'information' to 'knowledge' in the "Continuum of understanding," as proposed by the interaction designer Nathan Shedroff, is not accomplished in the process of understanding data; the information is presented to the home-patient but the transformation into meaningful knowledge, where practical applications and value are discovered, remains unrealized (Figure 2) [37]. This insight had later been grounded by the study of Aronson et al., classifying knowledge-based errors as a subset of medication errors [1]. Secondly, insights obtained from the healthcare sector included the continuous need for educating nurses with technological advancements, in which the standard '5 Rights' of safe medication administration however remained the same [16]. Furthermore, recommended strategies to reduce home medication errors, determined by the 'Council On Quality Improvement and Patient Safety' (COQIPS), had been taken into consideration [45]. This committee concluded that one of the recommended strategies to reduce home medication errors can be described as "Research to identify novel ways to support safe home medication administration" [45]. The result of the pressure cooker as well as the continuation of this study extends and complements this recommendation.

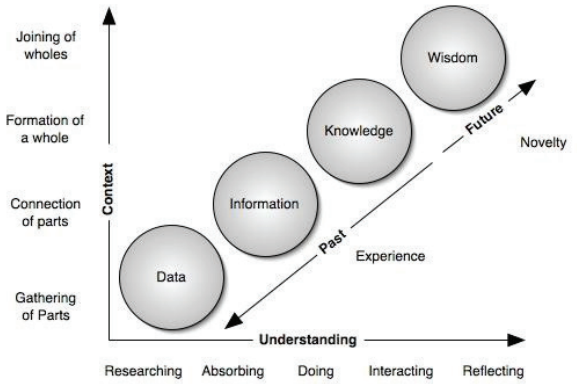

Figure 2. Continuum of understanding by Nathan Shedroff (2015)

The pressure cooker's final design consisted of categorizing the '5 Rights' into one card, in which the home patient had to confirm the information was understood by stamping a checkmark in the top-right corner (Figure 3). The intention behind this concept was to evoke the behavior of first confirming understanding before taking action or reading the next piece of information, thereby 'pausing' or focusing on a small piece of knowledge that is presented. This concept ultimately had been used as inspiration during the ideation phase of the study.

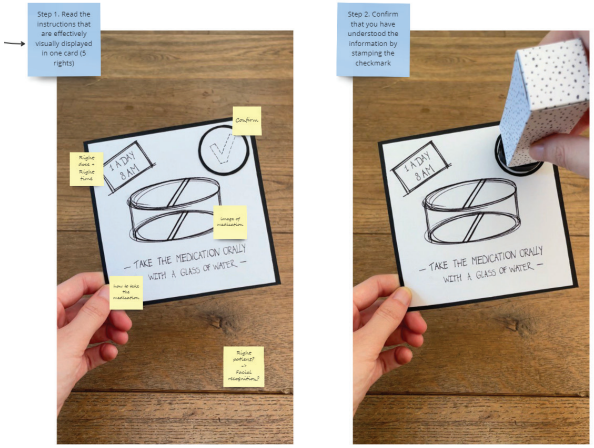

Figure 3. Result Pressure Cooker

Child Medication Administration: Perspective of Parents

To ensure the validity of the research and obtain more valuable results, the study narrowed its focus to a specific subcategory within the home-patient context: child medication administration in the home- environment as prescribed by a doctor. To grasp the real-life context of how information is provided to parents, including the different information sources that parents receive during this process, an expert had been contacted in the field of pediatric medicine. Within the context of explorative research, dr. Lonneke Bokken, pediatrician at Máxima MC Eindhoven, offered valuable insights into how medication is prescribed and the existing challenges that are currently present among parents in the Netherlands [28]. Taking the procedure within this hospital as example, it is standard for parents to first receive information about the medication verbally during a doctor's appointment. Subsequently, parents retrieve the prescribed medication from the pharmacy, where the medication label serves as an information source, alongside the provided medication leaflet and additional informational folders which are often provided. In some cases, video instructions are provided depending on the medication and the pharmacy or healthcare institution [21]. Besides, the current struggle of the provided information sources not answering the questions parents have regarding the medication has been acknowledged, an element that is elaborated further in the research artifact of the study.

Visual Ideation for Medication Information Enhancement

Due to the earlier established lack of understanding about medication-related instructions through the third-person perspective as well as the confirmation of the current information sources not expecting the desired needs in a real-life context, performing research on a new manner of conveying information presented itself. In alignment with the predominant role of human vision in perception, a sketching brainstorming session was performed to generate ideas for investigating a certain type of visual enhancement (Appendix B) [18]. Examples from this brainstorm include physically marking the intake of medication on the prescribed days by a doctor (2), physically constructing a tower of the '5 Rights' to enhance emphasis on this aspect (4), visualizing either a parent or a child depending on the information content (5), creating sections of information in which a complete answer to questions is displayed (6), and physically assigning pieces of information to specific spatial areas (7).

In the extension of this ideation, aspects had been elaborated further in a neat version to evaluate the realization of certain ideas (Appendix C). Within this visual prototyping approach, different illustrations of the medication tablet were explored; realistic, vectorized, see-through, and outlined, to assess the effectiveness of referencing to one tablet of medication. Furthermore, the possibility of placing the emphasis on headers for a certain categorization or directly conveying the core of the message had been examined; 'Dose' as opposed to 'Give up to 3 per day' respectively. Moreover, different representations of the calendar have been explored due to its inherent presence in the mental models of adults, resulting in the explained desired effect of recognition; the central link of perception [22, 29, 25]. Experimenting with the Gestalt principles during this ideation phase had been realized through i.a. closure; illustrated dashed circles under the dates of the calendar, proximity; narrowing the distance between the correct amount of tablets per age, continuity; utilizing outlined illustrations, and similarity; placing two lines at the border of the cards containing information about the '5 Rights' [19].

5 Rights

The '5 Rights' of safe medication administration are considered a crucial set of principles among healthcare practitioners to ensure the correct and safe administration of medication [16]. The 5 traditional rights include; Right Patient, Right Drug, Right Dose, Right Time, and Right Route [16]. Although each individual right, or the combination of all five, does not independently guarantee the prevention of all medication errors, education and practice highlight their significance because an error in any of these rights can lead to serious consequences [36]. Throughout the study, the potential to create an emphasis on these rights in the context of parents caring for their child in the home environment was acknowledged, considering the existing hierarchy of importance.

FINAL DESIGN

To evaluate and draw insights from a new approach in which the understanding process regarding medication-related instructions stands central, it is crucial to compare the outcomes to the conventional standard in this field. The final design, therefore, consists of two packages of information understanding, in which Package A is the conventional manner of receiving information for the target group; doctor's appointment, medication label, and medication leaflet, while Package B attempts to gather data through the research artifact

‘Minimed’; doctor’s appointment, medication label, Minimed (Figure 4). The choice of the brand name "Minimed" is based on the blend of word elements that communicate specific qualities related to the study. The use of "Mini" at the beginning suggests the intention for a brief and manageable process, indicating that the information is not difficult or overwhelming to understand, while the incorporation of "med" at the end serves as a clear reference to medication. In this study, Minimed should not be perceived as a direct replacement for the original medication leaflet, but instead, as a research artifact designed to investigate the incorporation of visuals, alternative categorization, and the employment of spatial arrangement. As a result, the findings of this study will contribute to the broader goal of assisting future endeavors that are aimed at transforming the medication understanding process, in which ultimately medication errors in the home environment can be reduced and overall child safety can be ensured.

Package A: Conventional medication leaflet

Within both Package A and B, the same dietary supplement ‘Vitakruid Magnesium Junior dietary supplement had been used as a substitute for medication to ensure a responsible investigation (Figure 4). To replicate a conventional medication leaflet for Package A, the publicly available information about the dietary supplement was retrieved from the brand Vitakruid and transformed into the layout and format of a medication leaflet [40]. During the creation of this leaflet, the construction of sentences followed the guidelines of ‘Understandable sentences for medication information’ established by the 'College ter Beoordeling van Geneesmiddelen', an independent authority overseeing the quality, function, and safety of medication in the Netherlands and across Europe [8, 9] (Appendix D). Furthermore, technical aspects of the readability of the medication leaflet had been considered following the technical guideline of readability of the CBG, such as an easy-to-read font where “i”, “l”, and “1” are easily distinguished, adhering to the minimal font size, the margin between columns, high contrast between the text and background, and presenting emphasized information-topic headers in bold [10].

Figure 4. Package A and Package B

Package B: Minimed

In Package B, the same informational content was utilized as in Package A, but now the design elements of visuals, alternative categorization, and spatial arrangement have been incorporated (Appendix E). For the chosen visuals, inspiration had been drawn from the visual prototyping approach, in which the realistic illustration was chosen for elements that are physically present in the Package; the medication bottle and the tablet, while the outlined illustration was chosen for visualizing unpresent elements that are referenced to within the text (Figure 5). The rationale behind choosing these specific illustration types was threefold; both illustration types can be recreated in future endeavors, provide clear representation based on feedback from TU/e's Midterm Demoday 2023 (Appendix F), and establish a visual distinction between present and absent elements in the Package. Additionally, findings from the study by Thomas Sanocki and Noah Sulman were taken into account, indicating that a harmonious color palette

Figure 5. Minimed

with fewer colors is more effective for remembering content [34]. Therefore, Package B is intentionally designed in alignment with this conclusion to prevent the color palette from interfering with the study's focus on content recall [34]. Consequently, Minimed features a color palette featuring white and blue, where the realistic illustrations harmoniously complement this color scheme. It is important to note that the color palette between Package A and Package B in this research is identical, to prevent bias. Moreover, Gestalt principles had been incorporated through i.a. continuation: arrows guiding the viewer's eye along a specific path of information, enclosure: placing a border around listed elements to highlight this content as distinct and to indicate that it should be perceived together, similarity;

leveraging the recognizable octagon shape stored in adults' implicit memory, positioned at the top-right corner of the heart and kidneys illustration, causing them to perceive them as grouped [12, 43, 11]. Moreover, building upon the statement of the WHO that 50–70.2% of medication-related harm can be prevented through comprehensive systematic approaches, a 2-step approach has been implemented in Minimed with the '5 Rights' of safe medication administration positioned at the highest level in the hierarchy (Step 1). The outstanding cards then have been categorized by providing an answer to the remaining frequently asked questions (Step 2) [24]. Lastly, the final design element in Minimed consists out of both steps instructing the participant to position the cards in a designated area in space, ensuring the spatial arrangement of the information. These areas include five wooden card holders for the '5 Rights' and a 4x3 raster for the remaining cards of frequently asked questions.

METHOD

Participants

In the study, participants were invited to join voluntarily and anonymously through the researcher's network. In alignment with the Dutch law, which states adolescents have the autonomy to make independent healthcare decisions and hold an independent right to information from age 16 onward, the study focused on parents with no children under this age [20]. Consequently, the information about the children's dietary supplement utilized in this study could not be adopted, preventing any harm. Furthermore, as the investigation was specifically centered on the Netherlands, the information presented in the final design is in Dutch. Seven participants with Dutch nationalities were recruited to contribute to the study's geographical focus, resulting in all participants being familiar with the concept of administering medication to their child [13]. Additionally, the information retrieved from Vitakruid contained no jargon, guaranteeing the clarity of the information text. Due to the research being aimed at assessing the differences in design elements between two packages presenting the same information, any potential correlation of education level was not a targeted aspect of this research. The study was conducted without compensation of any kind.

Data collection

Throughout the investigation, information was collected using both quantitative and qualitative measures. The initial quantitative measure involved evaluating the time required to read both Package A and Package B, to determine the efficiency of the incorporated design elements. The second quantitative measure involved examining the understanding of the information in both Packages A and B using criterion-based assessment, where responses could be correct, incorrect, or incomplete. The third quantitative measure assessed the time needed for recalling information in either Packages A or B to evaluate the effectiveness of memory retrieval. Finally, participants were tasked to choose a maximum of 6 cards perceived as highly understandable and another maximum of 6 cards that, in their opinion, could be enhanced for a better understanding of the information. This quantity was determined by letting participants make a distinct selection regarding the understandability of the total amount of cards, as well as practical feasibility reasons. Furthermore, the qualitative measures utilized in this study consisted firstly, of observational research during the search process of Package A and Package B. Secondly, interview questions were employed to gain knowledge about underlying perspectives. Thirdly, general observations were made throughout the study. Before the start of the research, consent had been given to record the answers of the study, which were pseudonymized during the data analysis.

Procedure

The investigation started with an explanation of the ethical regulations, the study's objectives, and the procedure that will be followed (Appendix H), as well as letting participants sign the consent form (Appendix G). The study began with re-enacting a doctor's appointment in which the right drug, right dose, and right time out of the '5 Rights' were mentioned, which had been confirmed by an expert in pediatric care at Máxima MC Eindhoven. Within this theoretical scenario, it is also mentioned the study involves a 5-year-old girl named Anna, who would be the hypothetical daughter of the participant. After the re-enactment of the doctor's appointment, the participant was instructed to read, or go through one of the packages; out of the 7 participants that had been conducted, 4 participants were asked to first read Package A, and afterward Package B, while the remaining 3 participants were asked to first read Package B and afterward Package A. After reading the first Package, the criterion-based assessment of understanding took place, in which no confirmation regarding the correctness of an answer was given. Next, it was instructed to read the second Package, in which the same questions of the criterion-based assessment of understanding could be asked. During these questions, participants were allowed to look back at the Packages. Subsequently, participants were presented with practical real-life questions about the dietary supplement, and they were directed to locate the answers first in the initial Package and then in the second Package. Questions for recall were the same for both packages and it was instructed to point at the location where the answer was found. During the search period, observations for each question were noted regarding their physical body language, behavior, and searching technique, in combination with possible quotes from the participant. Lastly, qualitative interview questions were asked in a semi-structured manner, to gather data about the three investigated design elements concerning the understanding process, the use of realistic illustrations and outlined illustrations in Minimed, the use of wooden card holders dividing the '5 Rights' and remaining frequently asked questions, their perspective on the difference in recalling information in both packages, and the reasoning behind why certain cards have been chosen as highly understandable or can be enhanced for better understanding with the gold and silver bulldog clips. The total time for conducting the study per participant ranged from 45-60 minutes.

Ethical Considerations

In adherence to the ethical review board (ERB) of the TU/e, the decision was made to conduct the study with a dietary supplement instead of medication. This decision could be made since the information content regarding a dietary supplement mirrors that of medication for the

patient [35]. Furthermore, the selection of this particular dietary supplement was influenced by i.a. the availability of various dosage and route options, and the potential to incorporate a diverse range of informational elements. Consequently, indirect questions could be employed to assess understanding, preventing participants from simply reading the answer without confirming comprehension.

Ethical Approval

The study received approval from the ethical review board of the TU/e on November 20, 2023.

Data analyse

The quantitative data regarding the total time required to read both Package A and Package B was analyzed through a boxplot, allowing for the calculation of the mean for both Packages (Figure 6). Furthermore, two additional visualizations were made to distinguish between the first and last readings of Package A and Package B (Figure 7, 8). In addition, Figure 9 visually represents the variations in reading times among participants for both Package A and Package B, to provide a detailed examination of how each participant engaged with the information presented in the two packages. The second quantitative measure consists of a bar chart visualizing the amount of correct, incorrect, or incomplete answers to the total amount of questions for either Package A or Package B (Figure 10). Due to the utilization of a criterion-based assessment for measuring understanding, predefined answers were created for participants' responses, enabling a comparison with correct answers (Appendix I). In this study, an answer is correct if it perfectly aligns with the established answer, incorrect if it deviates from the established answer, and incomplete if it partially corresponds to the established answer without covering the entire response. In addition, the total amount of correct, incorrect, and incomplete answers per question had been visualized in a bar chart for both Package A and Package B (Figure 11, 12). Moreover, the quantitative data for recalling information was analyzed and compared through a boxplot visualizing the required time for searching each question in both Package A and Package B to compare average search times (Figure 13). Also, the total amount of search time within Package A and Package B could be analyzed through the boxplot in Figure 14.

For the qualitative observational data gathered during the search process, specific observations were recorded for each question and structured in a 4x2 grid (Appendix J). The upper row represents the searching behavior for Package A, while the lower row refers to Package B. Each observation includes the search time and participant number in the lower-left corner of the sticky notes for contextual analysis. Furthermore, thematic analysis is employed to scrutinize overall study observations (Appendix K). Inductive reasoning is applied to develop themes, with a focus on identifying relationships, patterns, or associations between them. Lastly, the answers to the semi-structured qualitative questions have been placed in a grid to compare the answers per question for each participant (Appendix L). Within the study, the data from the qualitative interview questions in particular is analyzed in Dutch because a translation of this data could lead to misinterpretations in underlying perspectives. To provide additional context for questions 8 and 9, supplementary bar charts have been generated to visually represent the selected cards (Figure 15, 16).

RESULTS

During the study, potential bias could arise from the design, wherein participants first read one Package of information, followed by another Package containing the same information content (Figure 9). Therefore, during the study, 4 participants first read Package A, while 3 participants first read Package B, and the measured times were subsequently compared. The results suggested a surprising practical significance in the reading time of Package A, demonstrating an average increase of 1.06 minutes when participants read the information after Package B, as opposed to reading Package A initially. For Package B, the external factor of having previously read Package A was considered less significant, resulting in an average increase of 0.14 minutes compared to the initial reading time of Package B. To evaluate if there is a significant effect of the order in which participants read the packages, a t-test was performed in which the outcome was compared to a significance level of 0.05. The order in reading both Packages was not statistically significant with a p-value of 0.2008 for Package A, and a p-value of 0.7001 for Package B.

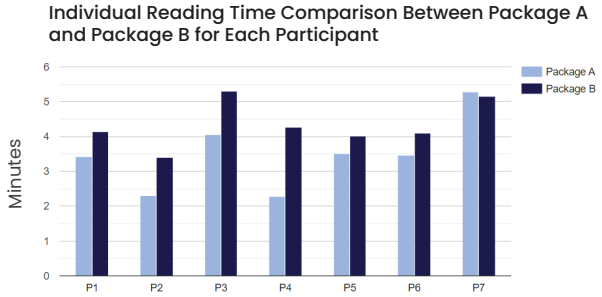

Figure 9. Histogram individual reading time

Efficiency

Comparing the time needed for reading Package A and reading Package B, the boxplot analysis demonstrates that, on average, participants spent less time reading Package A (3.17 minutes) compared to Package B (4.34 minutes) (Figure 6). Therefore, when considering efficiency as the minimization of time spent reading a specific package, Package A is preferred. However, considering efficiency in the context of mental effort or cognitive resources, the qualitative findings indicate that participants perceived Package A as more demanding [7]. Participant 7 expressed, "It's much more strenuous. I was already feeling discouraged when I had to read the backside as well when I flipped the page. It doesn't stimulate you either". Additionally, observational data highlighted that Participant 3 subjectively felt that it took longer to read Package A than Package B, although the reality was the opposite (Appendix K). Furthermore, participant 7 pointed out that due to the instruction approach, you are forced to read the information more

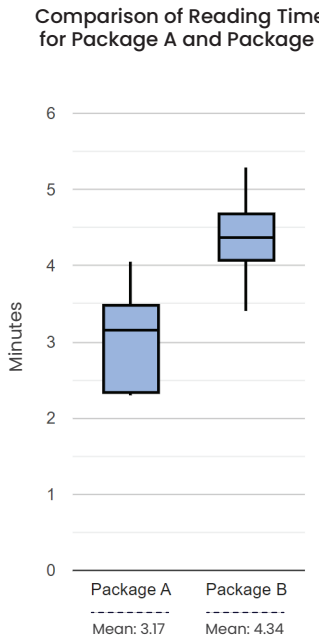

Figure 6. Boxplot PA/PB

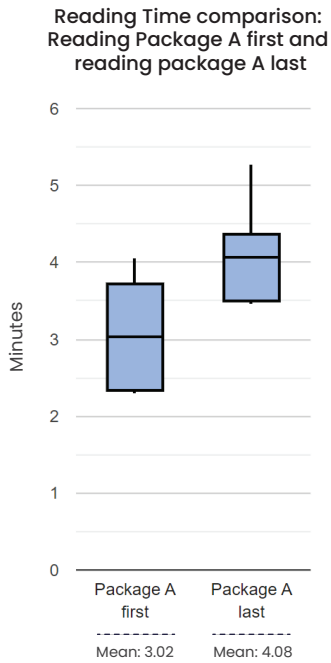

Figure 7. Boxplot PA/PA

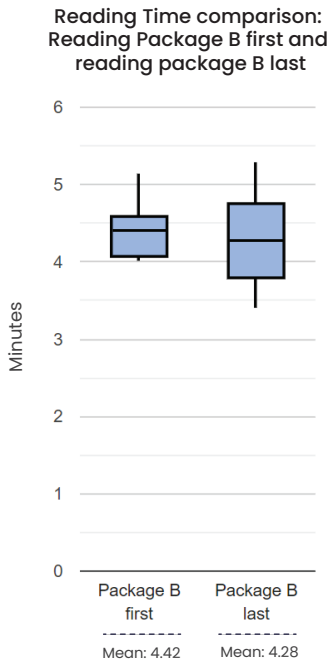

Figure 8. Boxplot PB/PB

consciously: “Here with those cards, you're reading much more consciously because you lay them out card by card (Package B). With this one (Packet A), you read diagonally through it”. Moreover, the cross-reference or referral to another section in both the information Packages revealed intriguing findings. Participant 6 mentions for instance when being asked for their perspective on the headings being in sequence in Package A, that this element is inefficient: “The only downside, of course, is that you have to turn the page when you are referred to another section”, on which participant 7 agrees: “Yes, those two pages, and that you have things like a cross-reference, that makes this method difficult, of course (Package A). This (Package B) is much clearer in organization”.

Understandability

The results from the quantitative criterion-based assessment of understanding visualized in Figure 10, revealed that Package B outperformed Package A in all three response categories. In total, 29 correct answers had been registered in (Package B) compared to 20 correct answers within (Package A), 1 incorrect answer within (Package B) compared to 9 incorrect answers within (Package A), and 5 incomplete answers within (Package B) compared to 6 incomplete answers within (Package A). When looking at the response categories per question (Figure 11, 12), it is noticed that Question 5: “Suppose you have forgotten to give the dietary supplement to your child for two days, how should you continue with the dosage?” was answered entirely correctly in both packages. Furthermore, Question 1: “Can you tell me what the correct dosage is for the child, and for how long you should administer this dosage?” and Question 4: “Suppose four days into regularly administering the dietary supplement to your child, you observe that your child is unusually fatigued throughout the day. Could you provide an explanation for this, and should any action be taken?” had been answered entirely correctly in Package B, while this was not the case for Package A. When analyzing the incorrect answers for Questions 1 and 4, additional insights could be gained. For Question 1, the incorrect duration of administration had been given based on a guess, a crucial aspect within the ‘5 Rights’, which was not confirmed by the participant. For Question 4, however, the first incorrect answer was caused by relying on personal knowledge rather than the presented information, ultimately giving the wrong side-effect as a possibility (Appendix I). In addition, the second incorrect answer for Question 4: “You’re not sure if it’s the magnesium”, can be led back to the “continuum of understanding” by Nathan Shedroff, illustrating that the step ‘knowledge’ is not reached in the understanding process when information is provided through Package A. Furthermore, Question 3: “Suppose a friend is visiting to play with your child, would you be allowed to give this dietary supplement to the friend as well? Why or why not?” stood out in the results of Package B with 2 correct, yet 5 incomplete answers. While the participants' answers would not have resulted in a medication error, it is noteworthy that the incomplete responses did not include the rationale for the child-specific administration, communicating factors such as age, weight, and health condition. On the contrary, participants replaced this information from the Package with a reasonable logical standpoint of their own: “This friend probably already has enough of the magnesium mineral” and “I don't want to take the responsibility for a child getting sick” (Participant 1, 2).

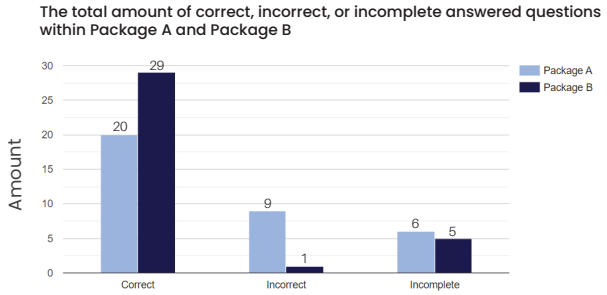

Figure 10. Histogram total amount of correct, incorrect or incomplete answers

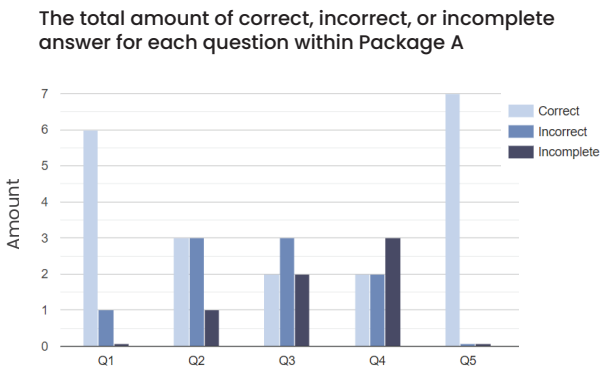

Figure 11. Histogram answer per question in Package A

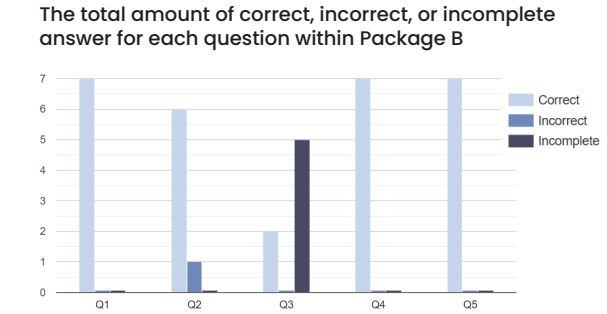

Figure 12. Histogram answer per question in Package B

Information recall

Within Figure 13, the average time for recalling information in Package A and Package B is displayed per question. As a result, the outcomes could easily be compared. The mean comparison of the required recall time suggests that every answer was located in a shorter time frame in Package B compared to Package A. Specifically, the absolute differences for Questions 1, 2, 3, and 4 were calculated as 35 seconds, 28.3 seconds, 3.4 seconds, and 38 seconds faster in Package B than in Package A, respectively. As a result, Questions 1 through 4 were found to be [3.8, 11.9, 1.7, 5.9] times faster in Package B than in Package A when considering the mean search time in Package B as a ratio to the mean search time in Package A. Moreover, Figure 14 revealed the overall recall time difference for both Packages, indicating that recalling information from Package A took an average of 28.7 seconds, while recalling information from Package B took an average of 4.08 seconds. As a result, recalling information within Package B took overall 7.0 times faster than finding the same information in Package A.

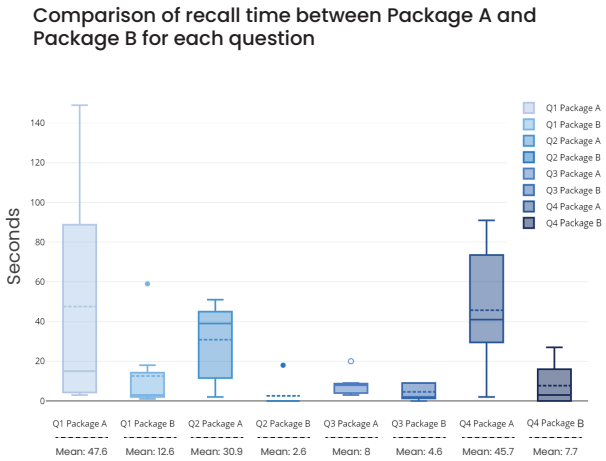

Figure 13. Boxplot recall time for each question in either Package A or Package B

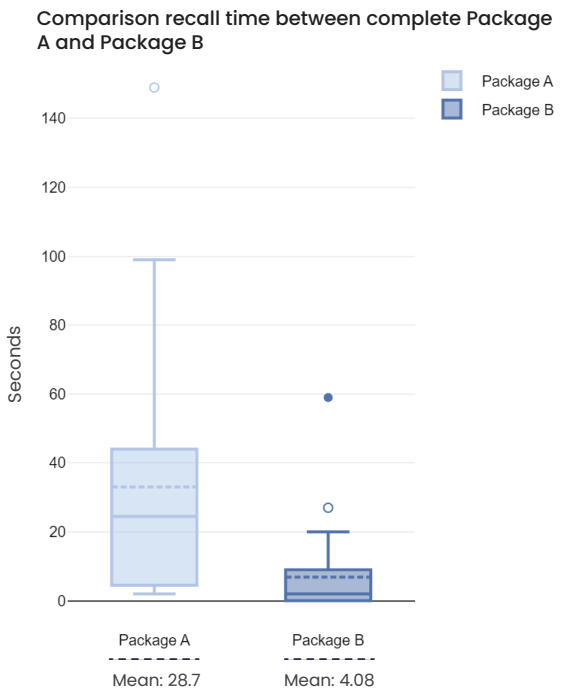

Figure 14. Boxplot mean recall time

Analyzing the results from the observational research regarding searching behavior revealed underlying patterns in the acquired data (Appendix J). First, the average recall time of 8 seconds for Question 3 stood out compared to the relatively longer recall times for the other three questions in Package A. The observational results suggest that the answer to this particular question could be easier found as the question regarding the ‘excessive dose of dietary supplement intake’ matched the header in Package A: “Uhm.. excessive dose was written here somewhere in the header..”, an element that was not true for the other three questions. Furthermore, it was observed that the question relating to Anna being a heart patient was found in 0 seconds for 6 Participants, indicating that participants pointed to the correct card displaying a heart illustration with their finger while the question was being read out loud. However, confusion arose for Participant 1, as other sections in the cards contained information that had something to do with the heart, namely ‘palpitations’ and ‘low blood pressure’ in the side-effects card. Overall, it was noticed during the recall of information that participants in general more confidently communicated an answer that was found in Package B, either verbally or physically by pointing with their finger at the right illustration, card, or header, compared to Package A where non-verbal cues of frowning and squeezing with the eyes had been registered. Participant 4 even wanted to give up during the searching process of Question 1 within Package A, while the Participant pointed within 3 seconds confidently to the right location in Package B with a smile. However, a personal distinction was observed in the recall of

information between Package A and Package B, as only Participant 3 could navigate through Package A effortlessly but faced more difficulty in finding answers in Package B.

General observations

For the study's overall observations, the themes identified through thematic analysis revealed potential connections, patterns, or associations, which had been identified through a connecting line (Appendix K). The first connection had been established between ‘Answering with own interpretation without verifying’ and ‘Discarding the information on the leaflet as paramount’. This connection indicates that information alone is not the sole factor in the knowledge-gaining process, but is heavily influenced by life experience, own interpretations, or logic, which in the study had effectively taken precedence over the presented information. Furthermore, the Packages were often compared to real-life scenarios by participants throughout the study, in which the preference for first going through the frequently searched-for information had been acknowledged in Package B, as well as the categorization corresponding to the real-life scenario of needing to find an answer: illustrating the connection between the themes ‘Reading the 5 rights first had a beneficial effect’ and ‘Real-life comparison gives the advantage to Package B’. Also the association between ‘high comparison behavior’ and ‘all information directly accessible vs front and back-side’ had been made. Due to the nature of Package B, the complete information is facing the Participant, while Package A contains a backside that is not directly in sight. Comparing information sections was therefore done more often and was found to be more intriguing in Package B, clarifying the observation of the often locked eyes toward the information. Package A, however, was only looked at when needed, and the leaflet needed to be flipped often. Furthermore, a noteworthy observation was made regarding the misunderstanding of information in Package B when the card did not directly provide an answer to a posed question, such as the information about what action to take after missing a dose for one day, while the actual question referred to a period of two days. Lastly, it was observed that the information itself was not always directly clear, verified by questions such as “Should I continue giving the magnesium on day 23 and day 24 if I missed 2 days?”. This provides the opportunity for introducing new informational elements in the standard medication information.

Underlying perspectives

The results of the qualitative interview questions provided underlying perspectives on various elements of the study (Appendix L). Firstly, the overall experience of retrieving information through information Package A was described as demanding considerable effort, feeling strenuous, requiring concentration, and lacking stimulation. The overall experience of Package B was positively received in terms of the understanding process, the visuals, categorization by frequently asked questions, and spatial arrangement, yet the comment on the Package taking up too much room had often been made. Furthermore, Package A contained unnecessary long sentences according to Participants 3 and 6, including in the headings, which made information recall more difficult. Participant 2 agrees with this perspective stating: “In fact, you have to reread the entire leaflet to deduce what you are looking for”. Participant 3 however, despite the long sentences, could locate answers effortlessly in the text of Package A location-wise, suggesting individual differences in information recall. The search technique for recalling information in Package B was based on a combination of the illustrated visuals and the text-based headers, in which the visuals more dominantly aided in spatially remembering the location, while the header afterward confirmed the right card had been found. Moreover, the underlying perspectives on the realistic and outlined illustrations revealed that all illustrations were understandable in their representation, yet improvements in some illustrations came to light during the process with silver bulldog clips in question 9. Furthermore, the insights regarding the placement of the '5 Rights' in the wooden blocks uncovered variations in results. Among the 7 participants, 4 understood that these cards held higher importance in the hierarchy of information, while 3 participants did not draw this conclusion. Within the first group of 4 partici pants, the significance of categorizing and prioritizing these cards separately was acknowledged, with Participant 5 expressing, "I think that's a very good idea, taking the basics separately, and essentially making it more efficient in that way."

The quantitative results of Questions 8 and 9 can be seen in Appendix M and Appendix N respectively, illustrating the total amount of chosen cards with high understandability (gold clips), and the total amount of chosen cards that could be improved for better understanding (silver clips). The underlying perspectives for each card can be found in Appendix L. Firstly, concerning the golden clips, the cards most frequently selected for high understandability were the ‘Right dose’ (Dosis) and the ‘Right route’ (Toediening) from the '5 Rights', along with the ‘Increased risk’ (Verhoogd risico) card, each with a count of 5. The underlying perspective given by Participants 2 and 3 describes that the illustrations directly support the accompanying text, such as the visualization of 3 realistic tablets with the text ‘3 tablets’ beneath it. Also, regarding the side-effects card (Bijwerkingen), the illustrated dashed box following the Gestalt principle of enclosure was considered very impactful, as it was more important to highlight this content as distinct rather than the outlined illustration next to the box according to Participant 1. Lastly, the silver clips were utilized most for the ‘Storage’ card (Bewaren) and the ‘Addition to nutrition’ card (Aanvulling op voeding), with a count of 3 and 2 respectively. Although the gestalt principle of enclosure had been utilized in the ‘Storage’ card as well, according to Participants, the information did not effectively communicate the information due to an excess of elements in the box. Furthermore, the ‘Addition to nutrition’ card was selected based on a missing action, or not understanding the intention behind why this information is provided. Finally, Participant 1 mentioned that there are 3 cards relating to dose, which he would like to have combined into 1 card, and Participant 5 highlighted that the Substances (Inhoud | Stoffen) should be included directly in the Allergy card (Allergie) for a more effective and efficient understanding process.

DISCUSSION

One key focus of this study was to assess the efficiency of the information understanding process. However, what makes this element significant in this context? According to dr. David Pearson, professor emeritus and former dean of the Graduate School of Education at the University of California, explains that efficiency makes reading easier and more comfortable, as it goes hand in glove with motivation and comprehension: “Think of it as a combination of skill, will, and thrill. efficiency provides the skill, motivation engenders the will, and comprehension leads to the thrill of acquiring new ideas” [4]. As a result, it can be argued from the findings in this study to what extent the prolonged reading time required for Package B compensates for the inefficient reading approach of Package A. Moreover, while the difference in reading time between reading Package A first and reading Package A last did not reach statistical significance, the absolute difference suggests that external factors are more likely to impact the efficiency of Package A. In contrast, in Package B, the overall reading time stayed relatively stable. This raises the question of whether comparable external human factors, such as fatigue -identified as the most common cause of medication errors among nurses - would potentially have fewer negative effects on participants while reading Package B than on Package A, if these factors were present during the study [15].

Limitations

The first limitation of the study involves the unmeasured influence of human factors such as fatigue, stress, emotional states, distraction levels, prior knowledge, or familiarity with the presented information, as the study's design and available resources did not allow for a valid measurement of these elements. Additionally, the simulated scenarios, including the doctor's appointment, direct presentation of the medication bottle, and instruction to read the information, may not entirely replicate the complexity of the understanding process in a real-life context. In practical situations, there is for instance more time between these three actions, and the information conveyed in a conversation might impact participants' information processing differently. Ultimately, the research conducted an examination focused on a distinct type of medication – a chewable tablet, categorized as a solid form of medicine [40]. Therefore, the scope for future investigations is constrained within this specific category, and it is not supported to utilize these findings in other categories of medicine, such as liquid medication or medication sprays.

FUTURE WORK | ENVISIONING

In the last 10 years, the pharmaceutical industry has been transformed by digitization and automation, introducing substantial changes in several areas [30]. Within the healthcare sector, this change expressed itself in technological advancements such as barcode medication administration (BCMA) for confirming the right patient, or computerized provider order entry (CPOE) for facilitating the prescription process [16]. Moreover, for the home patient, the era of digitalization caused medication apps to rise, in which reminder apps are predominantly on the market [27]. Additional functionalities such as educational tools, or the feature of asking questions to an AI assistant have been successfully developed [27]. However, when envisioning a realistic future, digital leaflets will not entirely replace paper leaflets, but will rather complement them [23]. Next to the internet potentially having accessibility issues due to cyberattacks and not everyone having access to digital devices, a pivotal aspect of this future outlook is derived from neuroscience; It consludes that digital information tends to be read selectively and with less attention when compared to something tangible that we can touch with our fingertips [23]. Supporting this vision of the future, Lonneke Bokken from Máxima MC pointed out that extensive research is conducted on the medication itself, including aspects like the taste of the tablet, its shape, and how it can be administered to the body, yet no significant change in the comprehension process of medication-related instructions is expected.

Currently, the conventional medication leaflets in the Netherlands adhere to CBG regulations, which last had been updated in 2009 [10]. However, it is noted that both this leaflet and existing digital apps share a similarity: they exclusively consider textual information and neglect any additional elements that are essential for an optimal understanding process for parents. To give an example, the AI assistant tool in medication apps indeed provides answers to all the questions parents could ask, yet the provided answer is solely text-based through an AI algorithm, and elements for an effective understanding process are not incorporated [33]. The aim of this study, therefore, had been set to acquire or discard elements that could aid or form a barrier in the understanding process. In response, and in accordance with the findings of the study, the following criteria for future endeavors could be incorporated into either tangible information sources or digital applications:

- Categorizing the information by frequently asked questions in which the header of a piece of information directly corresponds to the wording of a parent’s question
- Avoid offering general information to a posed question, but instead offer a specific as possible answer tailored to the posed question (e.g. AI)
- If necessary, provide transparency on the rationale behind a given instruction if it can be overridden by a reasonable logical standpoint
- Present all the relevant information to a certain question directly within the field of vision of the participant (e.g. AI)
- The understandability of the information increases when it is presented piece by piece, rather than providing the complete information in a single source
- Apply a systematic approach to the bulk of information, in which the most commonly sought-after information is arranged hierarchically, with the '5 Rights' positioned at the top level
- Incorporate the Gestalt principles within the information presentation, and ensure that visuals correspond directly with the accompanying text
- Use a harmonious color-pallete with fewer colors according to the color relations experiment of Sanocki and Noah Sulman: both realistic and outlined illustration types have been identified as effective for representing present and absent elements in the package respectively

- For information recall, ensure visuals are unique for each piece of information, and headers afterward confirm the answer to a posed question
- Minimize the use of cross-references to other sections and, instead, duplicate information across multiple sections when necessary

CONCLUSION

In this study, the research artifact “Minimed” was employed to gather data on the understanding process of medication-related instructions for parents administering medication to their child in the home environment. The conducted study consisted of two Packages, in which Package A included the information sources of a doctor's appointment, medication label, and a conventional medication leaflet, while Package B solely replaced the conventional medication leaflet with Minimed. Moreover, the design elements scrutinized in the study (text with visuals, categorization by frequently asked questions, and spatial arrangement), identified during the initial stages, were also in agreement with the potential to positively impact the perception stage of the human understanding process [38]. The objective, therefore, was to investigate whether these elements would aid in transitioning from 'information' to 'knowledge' within the "Continuum of understanding" by Nathan Shedroff [37].

Quantitative measures, including boxplots and bar charts, were employed to assess efficiency, understandability, and information recall. Qualitative measures provided insights into searching behavior, design elements, and general observations. Qualitative analysis involved comparing answers per question using a grid or thematic analysis with inductive reasoning to derive themes. The results of the study suggest that Package B demonstrated greater efficiency across all aspects of the definition, except for the necessary absolute time to read the package; 4.34 minutes (Package B) as opposed to 3.17 minutes (Package A). Furthermore, Package B excelled in information recall in the quantitative results, where, on average, information was located 7.0 times faster than in Package A. The search technique for most participants was derived from scanning the visuals whereafter the header gave the confirmation the right information had been found. Furthermore, the spatial arrangement of assigning the cards of Package B to a specific location in space aided in the understanding process, as every card was more consciously read in this manner. However, no direct advantage had been registered in recalling information through spatial arrangement, as Participants still needed to scan over the cards to locate the correct information. The fact that the entire information was in the field of vision, however, was highly preferred in comparison to the flipping of the page in Package A. Finally, the inclusion of both realistic and outlined visuals in Package B achieved clear representations of present or absent elements respectively, thereby enhancing the overall understandability of the information, particularly when they directly matched the accompanying text.

To reduce medication errors in the perception stage of reading a physical medication leaflet, this study determines that a systematic approach to medication-related instructions, categorizing the complete information into individual segments with the '5 Rights' placed at the highest level, should be implemented for better understanding. Moreover, it is advised to integrate the three design elements as described in the Future Envisioning section of this report in either tangible or digital information sources. Consequently, this study urges medication app developers, industrial designers, and regulatory bodies like the ‘College ter Beoordeling van Geneesmiddelen’ to prioritize the element of understanding in their initiatives and incorporate the findings of this study into their future creations.

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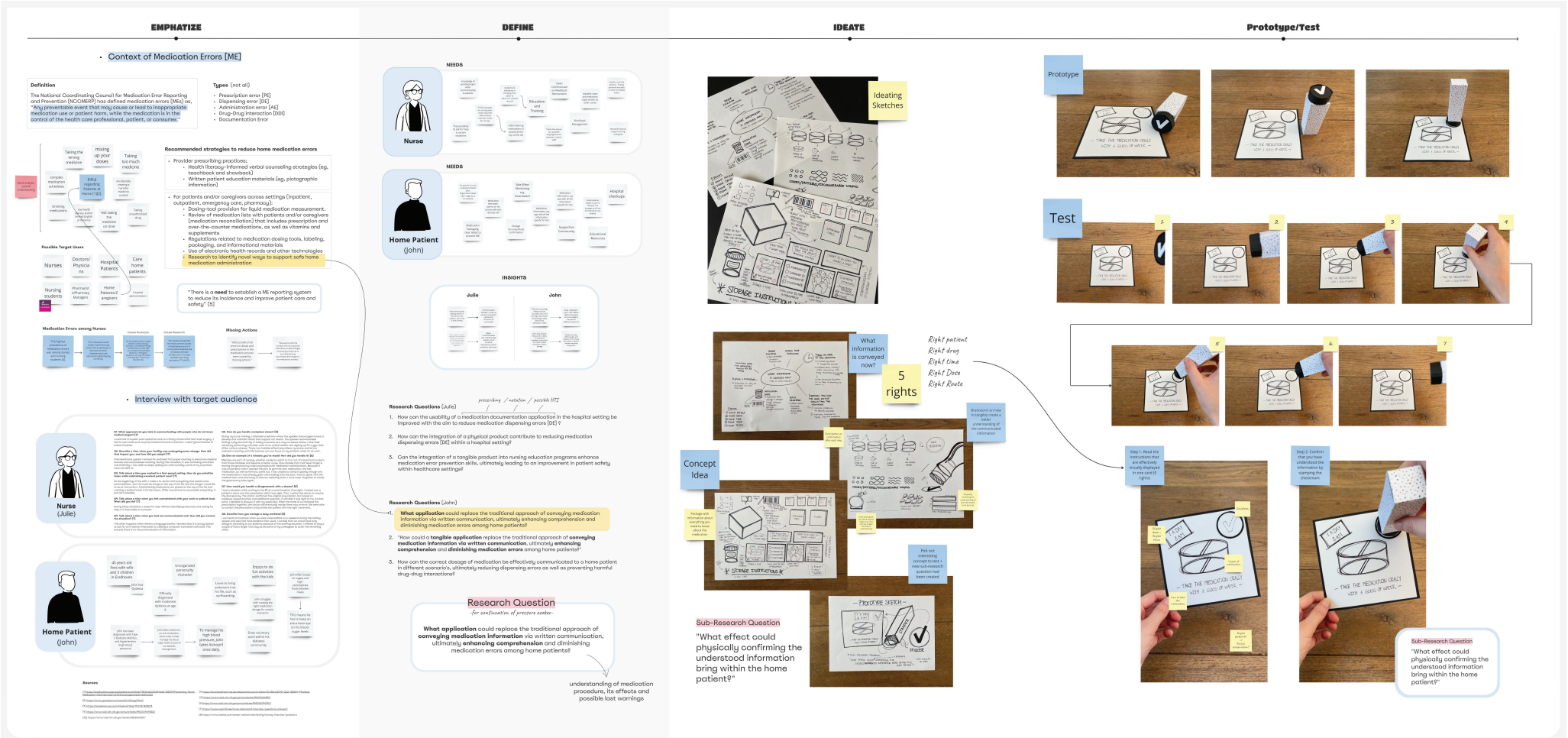
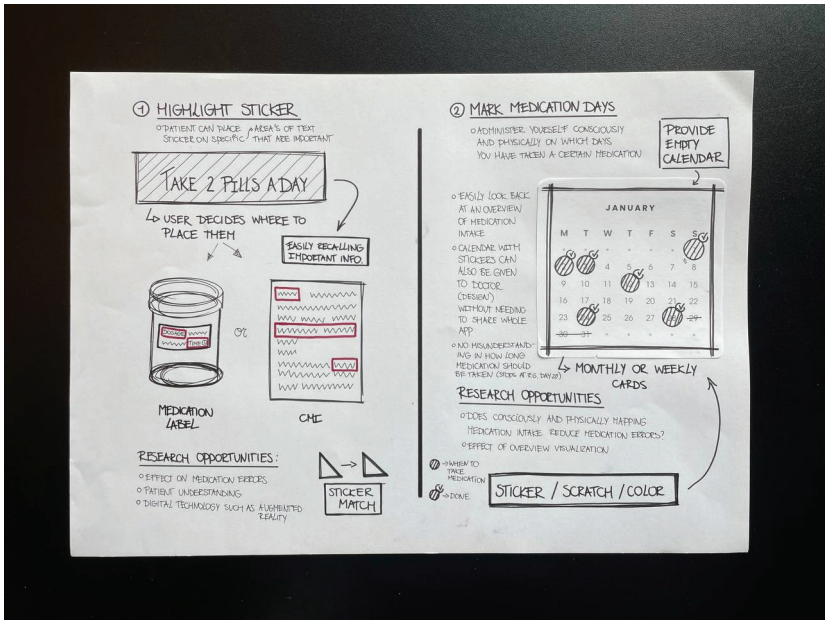
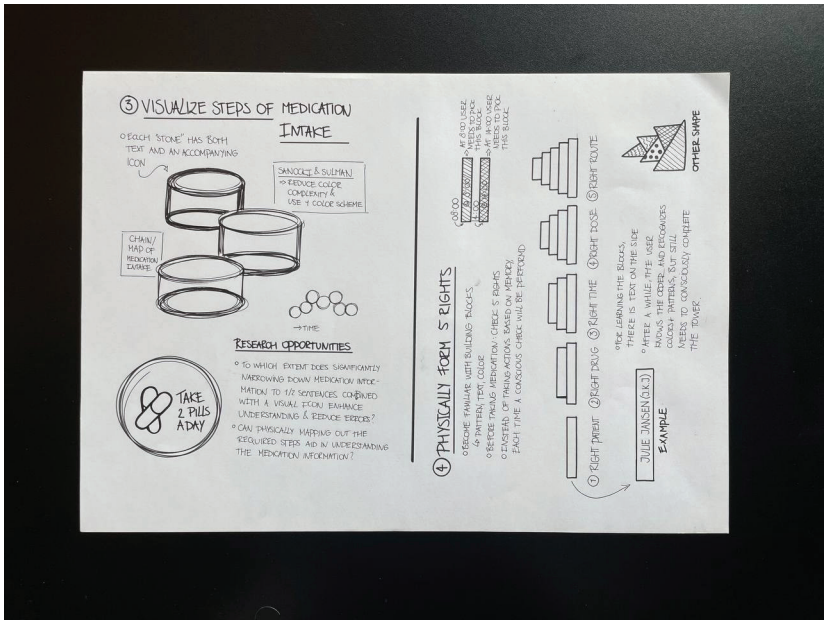
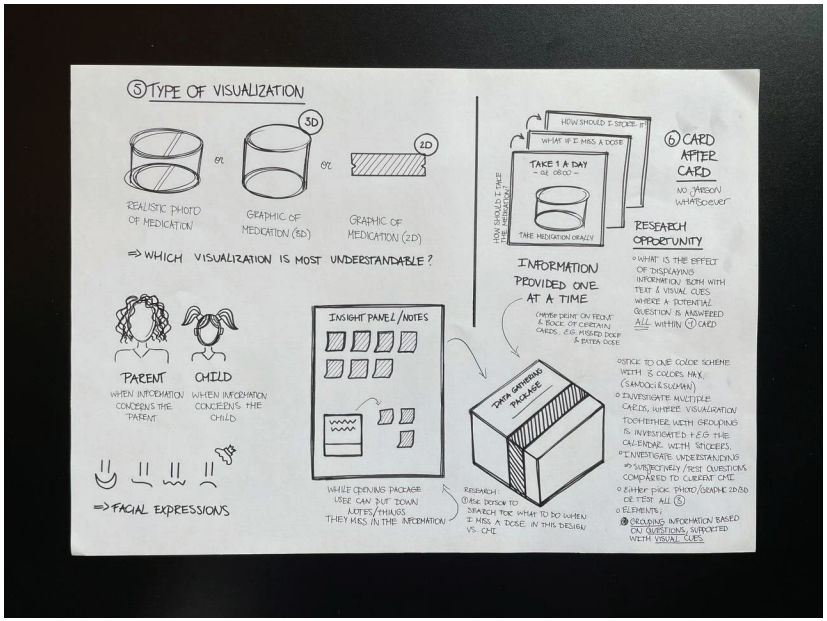
Appendix A. Pressure Cooker

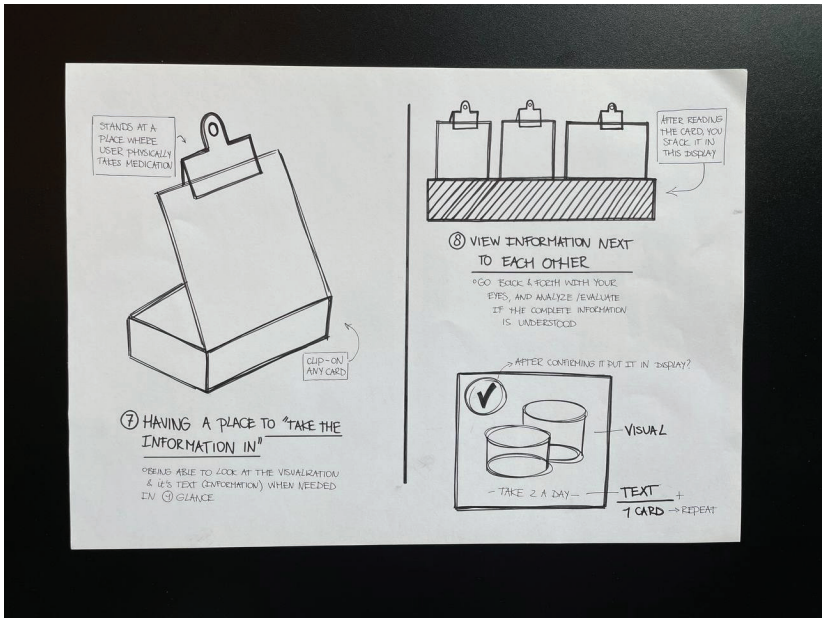


Appendix B. Sketches Visualization possibilities

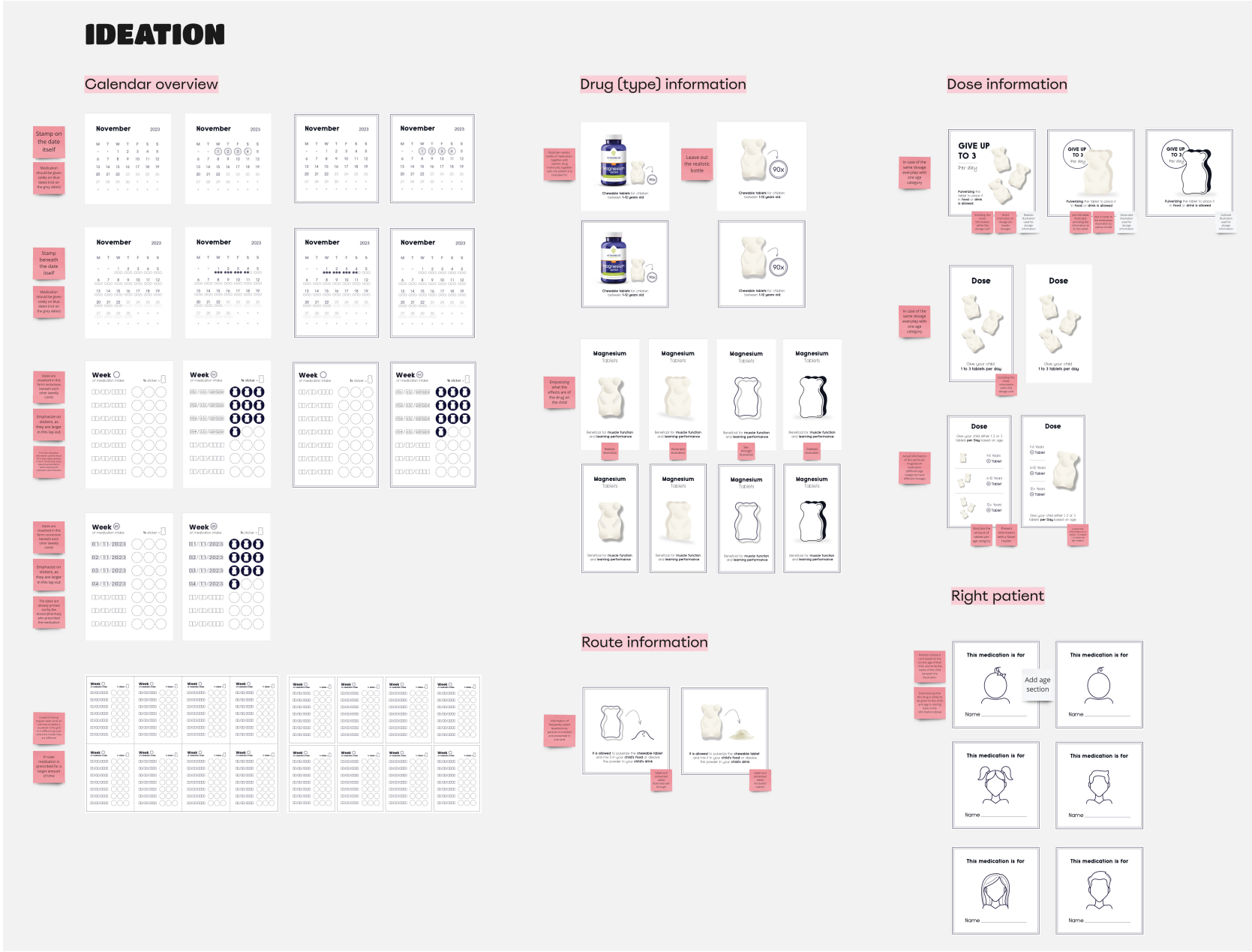








Appendix C. Neat iteration: Evaluate realization



Appendix D. Conventional medication leaflet (Package A)

Bijsluiter: Informatie voor de gebruiker

Vitakruid Magnesium Junior kauwtablet 40 mg frambozen

Magnesium

Lees goed de bijsluiter voordat u dit voedingssupplement gaat gebruiken want er staat belangrijke informatie in voor u.
Gebruik dit voedingssupplement altijd precies zoals beschreven in deze bijsluiter of zoals uw arts of apotheker dat heeft verteld.

- Bewaar de bijsluiter. Misschien heeft u hem later weer nodig
- Heeft u nog vragen over het gebruik van voedingssupplementen en de risico's ervan? Wilt u controleren of ze voldoende effect hebben? Of waarborgen dat ze veilig zijn? neem dan contact op met uw apotheker
- Heeft u nog vragen over de bijwerkingen die in rubriek 4 staan? Of waarom dit voedingssupplement is voorgeschreven? Neem dan contact op met uw arts.
- Dit voedingssupplement mag alleen worden toegediend aan het specifieke kind waarvoor het door een arts is voorgeschreven. Dit is gebaseerd op basis van leeftijd, gewicht en gezondheidsconditie.
- In het geval de informatie niet overeenkomt tussen verschillende bronnen, geef dan voorrang aan de informatiebron in de volgorde:
  1. Medicatie label
  2. Bijsluiter
  3. Bijgeleverde folders

Inhoud van deze bijsluiter

1. Wat is vitakruid magnesium junior kauwtablet 40 mg frambozen en waarvoor wordt dit voedingssupplement gebruikt?

Vitakruid magnesium junior kauwtablet 40 mg frambozen zijn tabletten van 40 mg van het werkzame bestanddeel magnesium.

Voedingssuplementen
Voedingssupplementen zijn bedoeld als aanvulling op een evenwichtig voedingspatroon. Een breed scala aan voedingsmiddelen bevat het essentiële mineraal magnesium. Naast noten, zaden en pitten, zijn spinazie, avocado's, bananen en pure chocolade ook rijke bronnen van dit mineraal.

Toepassing van het voedingssupplement
Het mineraal magnesium is betrokken bij wel honderden lichaamsprocessen. Ook voor kinderen in de groei is het mineraal belangrijk omdat het onder meer bijdraagt aan de aanmaak van cellen en weefsels. Magnesium is daarnaast van belang voor de samenstelling van de botten en de opbouw van sterke tanden. Ook ondersteunt dit voedingssupplement een goede leerprestatie en bevordert het de spierfunctie.

2. Wanneer mag u dit voedingssupplement niet gebruiken?

Uw kind is allergisch voor een van de stoffen in dit voedingssupplement. Deze stoffen kunt u vinden in rubriek 6.

3. Hoe gebruikt u dit voedingssupplement?

De aanbevolen dosering is:
Kinderen in de leeftijd van 1 tot 6 jaar:
1 tablet (40 mg) per dag
Kinderen in de leeftijd van 6 tot 12 jaar:
2 tabletten van 40 mg per dag
Kinderen in de leeftijd vanaf 12 jaar:
3 tabletten van 40 mg per dag

Het voedingssupplement dient voor 22 dagen te worden toegediend aan uw kind.

De tablet dient gekauwd te worden met de kiezen van uw kind. Daarnaast kunt u de tablet fijn stampen en mengen door het drankje of eten van uw kind.

Heeft uw kind teveel van dit voedingssupplement ingenomen?
Heeft uw kind teveel magnesium ingenomen dan is dit niet direct gevaarlijk. Echter, in het geval van een langdurig magnesium overschot, te herkennen aan de bijwerkingen genoemd in rubriek 4, neem dan onmiddelijk contact op met uw arts of apotheker.

Bent u vergeten dit voedingssupplement aan uw kind te geven?
Mocht u vergeten zijn een dosis te geven aan uw kind, sla deze dan over en ga verder met de volgende dosis. Neem nooit een dubbele dosis om de vergeten dosis in te halen.

4. Mogelijke bijwerkingen

Zoals alle voedingssupplementen kan ook bij dit voedingssupplement bijwerkingen optreden. Bijwerkingen zullen in eerste instantie alleen voorkomen bij een overmatig gebruik van het voedinssupplement vitakruid magnesium junior kauwtablet 40 mg frambozen.

Wanneer uw kind dit voedingssupplement gebruikt kunnen de volgende bijwerkingen optreden:

- Enkele gevallen van buikkrampen zijn beschreven.
- Enkele gevallen van diarree zijn waargenomen.
- Enkele gevallen van misselijkheid zijn geregistreerd.
- Enkele gevallen van moeheid zijn beschreven.
- Enkele gevallen van spierzwakte zijn geregistreerd.
- Enkele gevallen van hartkloppingen zijn geregistreerd.
- Enkele gevallen van dorst zijn beschreven.
- Enkele gevallen van een lage bloeddruk zijn gereistreerd.

Met name kinderen met nier- en hartproblemen lopen een verhoogd risico. Valt uw kind in deze categorie, neem dan nooit een magnesiumsupplement zonder een arts te raadplegen.

Het melden van bijwerkingen
Krijgt uw kind last van bijwerkingen, neem dan contact op met uw arts of apotheker. Dit geldt ook voor mogelijke bijwerkingen die niet in deze bijsluiter staan.

5. Hoe bewaart u dit voedingssupplement?

Bewaar het supplement droog, donker en op kamertemperatuur (15 -25 °C). Buiten het bereik van kinderen houden.

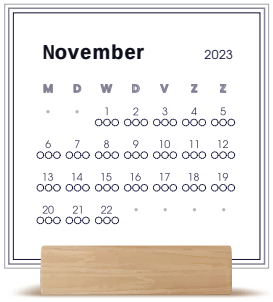
Gebruik dit voedingssupplement niet meer na de uiterste houdbaarheidsdatum. Die is te vinden op de verpakking onder “ten minste houdbaar tot einde”. Daar staat een maand en een jaar. De laatste dag van die maand is de uiterste houdsbaarheidsdatum.

6. Inhoud van de verpakking en overige informatie

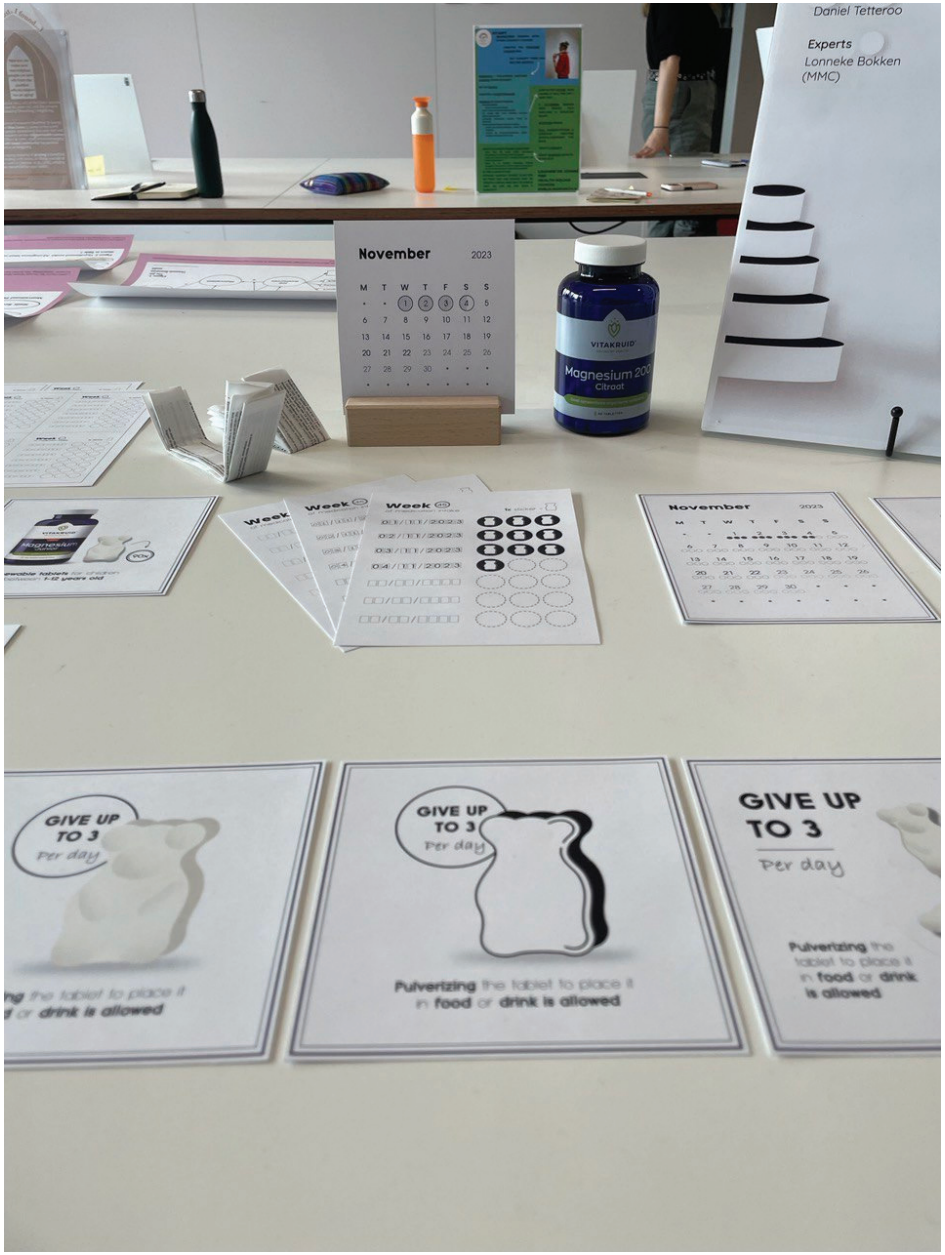
Welke stoffen zitten er in het voedingssupplement?
De stoffen in dit voedingssupplement zijn xylitol, magnesium malaat, sorbitol, appelazijn extract, stearinezuur, natuurlijke frambozen aroma, acacia gom, en magnesium stearaat

Hoe ziet vitakruid magnesium junior kauwtablet 40 mg frambozen eruit en hoeveel zitten er in een verpakking?
De verpakking bevat 90 tabletten in de vorm van een beertje.

Appendix E. Minimed (Package B)



Appendix F. Midterm demoday



Appendix G. Consent form

Informatieblad voor onderzoek "[Medicatie begrijpelijkheid - Minimed]"

1. Inleiding

U bent gevraagd om deel te nemen aan het onderzoek "medicatie begrijpelijkheid – Minimed".

Deelname aan dit onderzoek is vrijwillig: u besluit zelf of u mee wilt doen. Voordat u besluit tot deelname, willen wij u vragen de volgende informatie door te lezen, zodat u weet waar het onderzoek over gaat en wat er van u verwacht wordt. Op basis van die informatie kunt u middels de toestemmingsverklaring aangeven of u toestemt met deelname aan het onderzoek.

U bent natuurlijk altijd vrij om vragen te stellen aan de onderzoeker Susan Draaijer [Contact email s.h.m.l.draaijer@student.tue.nl] of onderzoeksleider Daniel Tetteroo [Contact email d.tetteroo@tue.nl], en/of deze informatie te bespreken met voor u bekenden.

2. Doel van het onderzoek

Dit onderzoek wordt geleid door [Susan Draaijer]. Het doel van deze studie is om te onderzoeken in hoeverre het integreren van visuele verbeteringen, alternatieve categorisatie en ruimtelijke ordening in de originele bijsluiter, met bijzondere aandacht voor de '5 rechten', bijdraagt aan de begrijpelijkheid van medicatie informatie. In het onderzoek zal het voedingssupplement Magnesium Junior gebruikt worden als medicatie voorbeeld. Het is belangrijk dat u begrijpt dat deze informatie niet als bron kan worden gezien voor enige vorm van toedienen van medicatie, hier zal u aan het einde van dit formulier bevestiging voor geven. De inzichten die voortkomen uit deze studie zal toekomstig onderzoek informeren over hoe deze ontwerpelementen (visuele verbetering, alternatieve categorisatie, ruimtelijke ordening) van invloed zijn op het begrip van ouders die toezicht houden op medicatie voor hun kinderen. De bevindingen van deze studie dragen bij aan een breder begrip van het verminderen van medicatiefouten om zo de veiligheid van kinderen te waarborgen.

3. Wat houdt deelname aan de studie in?

U neemt deel aan een onderzoek waarbij we informatie zullen verzamelen door middel van

- Een vragenlijst voor te leggen over zowel de begrijpelijkheid van informatie als het terugzoeken van informatie voor twee pakketten van bijsluiters
- U te interviewen over uw mening gerelateerd aan de ontwerpelementen die worden onderzocht in dit onderzoek
- Observatie
- Verder zal er audio worden opgenomen als u hiervoor toestemming geeft aan het einde van het formulier

Het onderzoek zal ongeveer 45-60 minuten duren en geschiedt volledig anoniem. De uit het onderzoek verkregen gegevens zullen niet tot u herleidbaar zijn.

U ontvangt voor deelname aan dit onderzoek geen vergoeding.

4. Potentiële risico's en ongemakken en intrekken van toestemming

Er zijn geen fysieke, juridische of economische risico's verbonden aan uw deelname aan deze studie. U hoeft geen vragen te beantwoorden die u niet wilt beantwoorden. Uw deelname is vrijwillig. Dit betekent dat u uw deelname op elk gewenst moment mag stoppen door dit te melden bij de onderzoeker. U hoeft niet uit te leggen waarom u wilt stoppen met deelname aan het onderzoek. Het stopzetten van deelname heeft geen nadelige gevolgen voor u.

Als u tijdens het onderzoek besluit om uw medewerking te staken, zullen de gegevens die u reeds hebt verstrekt tot het moment van intrekking van de toestemming in het onderzoek gebruikt worden.
Wilt u stoppen met het onderzoek, of heeft u vragen en/of klachten? Neem dan contact op met onderzoeker Susan Draaijer [Contact email s.h.m.l.draaijer@student.tue.nl] of onderzoeksleider Daniel Tetteroo [Contact email d.tetteroo@tue.nl].

5. Vertrouwelijkheid van gegevens

De ruwe en bewerkte onderzoeksgegevens worden bewaard voor een periode van een half jaar. Alleen de onderzoeker Susan Draaijer [Contact email s.h.m.l.draaijer@student.tue.nl] en onderzoeksbegeleider Daniel Tetteroo [Contact email d.tetteroo@tue.nl] zullen inzicht hebben tot deze gegevens. Uiterlijk na het verstrijken van een half jaar zullen de gegevens worden verwijderd. De onderzoeksgegevens worden indien nodig (bijvoorbeeld voor een controle op wetenschappelijke integriteit) en alleen in anonieme vorm ter beschikking gesteld aan personen buiten de onderzoeksgroep.

Uw geanonimiseerde gegevens kunnen beschikbaar worden gesteld voor toekomstig onderzoek, bijvoorbeeld door het delen van die gegevens met collega-onderzoekers of het beschikbaar stellen van data via een data archief of repository.

Dit onderzoek is beoordeeld en goedgekeurd op [28-11-2023] door de ethische toetsingscommissie van de Technische Universiteit Eindhoven.

Consent formulier ethiek – Versie 1.0 – mei 2023

Appendix G. Consent form

Toestemmingsformulier voor deelname volwassene

Door dit toestemmingsformulier te ondertekenen erken ik het volgende:

1. Ik ben voldoende geïnformeerd over het onderzoek door middel van een separaat informatieblad. Ik heb het informatieblad gelezen en heb daarna de mogelijkheid gehad vragen te kunnen stellen. Deze vragen zijn voldoende beantwoord.

2. Ik neem vrijwillig deel aan dit onderzoek. Er is geen expliciete of impliciete dwang voor mij om aan dit onderzoek deel te nemen. Het is mij duidelijk dat ik deelname aan het onderzoek op elk moment, zonder opgaaf van reden, kan beëindigen. Ik hoef een vraag niet te beantwoorden als ik dat niet wil.

Ik, **(NAAM) .....** heb dit toestemmingsformulier gelezen en begrepen en ik heb de gelegenheid gehad om vragen te stellen.

Deelnemer's handtekening: Datum:

Ik, **(NAAM) .....** heb begrepen dat de informatie over het voorbeeld voedingssupplement Magnesium Junior niet kan worden gezien als een toekomstige bron bij het toedienen van enige ander vorm van medicatie.

Deelnemer's handtekening: Datum:

Ik, **(NAAM) .....** geef toestemming voor het opnemen van audio tijdens de studie, die gepseudonimiseerd zal worden in resulterende documentatie.

Deelnemer's handtekening: Datum:

Onderzoeker's handtekening: Datum:

Appendix H. Research protocol

Research protocol - Minimed

Ten eerste, bedankt voor het meedoen aan mijn onderzoek. Ik zal eerst uitleggen waar het over gaat en wat dadelijk de bedoeling is. Ik zit nu in mijn eerste jaar-Master's van de studie Industrial Design op de TU/e, en ik ben de afgelopen weken bezig geweest om me te verdiepen in het onderwerp van medicatie fouten voor ouders die medicatie toedienen aan hun kinderen in een thuissituatie. Dus in het ziekenhuis krijgen ouders een bepaalde medicatie voorgeschreven die ze thuis voor een bepaalde tijd toe moeten dienen aan hun kind.

Op dit moment zijn medicatiefouten nog steeds een groot probleem, ook vooral in het begrijpings proces van de medicatie. Dit is dan ook waar dit onderzoek over gaat. Hier voor je zie je 2 pakketten als het ware van informatiebronnen. De linker is hoe nu informatie wordt gegeven aan ouders, en de rechter is een nieuwe manier die getest wordt in dit onderzoek. Door ethische redenen is er een voedingssupplement gekozen in dit onderzoek wat centraal staat, inplaats van een medicijn, maar de informatie die je dadelijk gaat inlezen is wel op de manier beschreven zoals het voor een medicijn beschreven zou zijn.

Wat gaan we dadelijk doen? Aan het begin van de research zal ik je eerst mondeling informatie geven die de dokter verteld zou hebben aan een ouder in het ziekenhuis. Daarna is het de bedoeling dat je eerst deze bijsluiter helemaal doorleest. Als je hiermee klaar bent dan zal ik hier wat vragen over stellen. Vervolgens herhalen we dit, en doen we hetzelfde met het andere pakket.

-Zijn er nog vragen?-

Consent form
Laat de deelnemer de consent form lezen en ondertekenen - [Zet audio opname aan]

STAP 1. Afspraak doctor
In dit voorbeeld moet je je inbeelden dat je een kind hebt van 5 jaar oud, een meisje genaamd Anna die het voedingssupplement Magnesium Junior voorgeschreven krijgt omdat er een tekort is opgemerkt en het essentieel is voor een opgroeiend kind. Anna moet één tablet per dag binnenkrijgen voor 22 dagen lang.

STAP 2. Informatiepakket A
Stelt u voor dat u het voedingssupplement gehaald heeft bij de apotheker, of in het ziekenhuis zelf (geef Magnesium Junior aan deelnemer). Lees nu deze hele bijsluiter door, hierna zal ik wat vragen stellen. **[TIMER AAN]**

[Quantitatieve test vragen]

Vraag 1
Kun je mij vertellen wat de correcte dosis is voor Anna, en hoe lang je deze dosis moet geven?

***Antwoord**: 1 tablet per dag, voor 22 dagen lang*
***Antwoord deelnemer**:*

Vraag 2
Stel dat Anna allergisch is voor parvalbumine (een stof die voorkomt in vis), is het dan toegestaan om dit voedingssupplement te geven?

***Antwoord**: Ja, dat mag aangezien parvalbumine niet in het voedingssupplement zit*
***Antwoord deelnemer**:*

Vraag 3
Stel dat er een vriendin op bezoek is om te spelen met Anna, zou je deze vriendin dit voedingssupplement mogen geven? Waarom wel of waarom niet?

***Antwoord**: Nee, dat mag niet omdat het voorgeschreven voedingssupplement kind-specifiek is en gebaseerd op leeftijd, gewicht en gezondheidsconditie*
***Antwoord deelnemer**:*

Vraag 4
Stel dat een paar dagen nadat je begonnen bent met het toedienen van het voedingssupplement aan Anna, je merkt dat ze gedurende de dag ongewoon vermoeid is. Zou je me kunnen vertellen of het voedingssupplement hier iets mee te maken zou kunnen hebben, en of er in dit geval maatregelen moeten worden genomen?

***Antwoord**: Dit kan opgemerkt worden omdat het als een van de bijwerkingen genoemd wordt. De ouder zou in dit geval contact op moeten nemen met de arts of apotheker*
***Antwoord deelnemer**:*

Vraag 5
Stel dat je vergeten bent om twee dagen lang het voedingssupplement te geven aan Anna, hoe moet je dan doorgaan met de dosering?

***Antwoord**: Dan zou je verder moeten gaan met de volgende dosis in het schema. De vergeten dosis mag niet ingehaald worden.*
***Antwoord deelnemer**:*

STAP 3. Informatiepakket B
Nu gaan we hetzelfde doen voor pakket B.

Lees nu dit medicatie pakket door [*verplaats Magnesium Junior naar de andere kant*]
[Quantitatieve test vragen]

Vraag 1
Kun je mij vertellen wat de correcte dosis is voor Anna, en hoe lang je deze dosis moet geven?

Appendix H. Research protocol

Antwoord: *2 tabletten per dag, voor 22 dagen lang*
Antwoord deelnemer:

Vraag 2
Stel dat Anna allergisch is voor parvalbumine (een stof die voorkomt in vis), is het dan toegestaan om dit voedingssupplement te geven?

Antwoord: *Ja, dat mag aangezien parvalbumine niet in het voedingssupplement zit*
Antwoord deelnemer:

Vraag 3
Stel dat er een vriendin op bezoek is om te spelen met Anna, zou je deze vriendin dit voedingssupplement mogen geven? Waarom wel of waarom niet?

Antwoord: *Nee, dat mag niet omdat het voorgeschreven voedingssupplement kind-specifiek is en gebaseerd op leeftijd, gewicht en gezondheidsconditie*
Antwoord deelnemer:

Vraag 4
Stel dat een paar dagen nadat je begonnen bent met het toedienen van het voedingssupplement aan Anna, je merkt dat ze gedurende de dag ongewoon vermoeid is. Zou je me kunnen vertellen of het voedingssupplement hier iets mee te maken heeft, en of er in dit geval maatregelen moeten worden genomen?

Antwoord: *Dit kan opgemerkt worden omdat het als een van de bijwerkingen genoemd wordt. De ouder zou in dit geval contact op moeten nemen met de arts of apotheker*
Antwoord deelnemer:

Vraag 5
Stel dat je vergeten bent om twee dagen lang het voedingssupplement te geven aan Anna, hoe moet je dan doorgaan met de dosering?

Antwoord: *Dan zou je verder moeten gaan met de volgende dosis in het schema. De vergeten dosis mag niet ingehaald worden.*
Antwoord deelnemer:

STAP 4. Measure Recall [Time zoektijd totdat de juiste informatie gevonden is]
Kun je het antwoord opzoeken en me laten zien waar je het hebt gevonden voor de volgende vragen?

Vraag 1
Op welke verschillende manieren kun je het voedingssupplement toedienen aan Anna? [TIME SEARCH]

Antwoord: *Anna kan de tablet kauwen met haar tanden, het kan opgelost worden in haar drinken of het kan gemixt worden door het eten.*

Observatie zoeken:

Vraag 2
Stel dat Anna als baby een hartoperatie heeft ondergaan en daarom is geïdentificeerd als een hartpatiënt, kan Anna dan dit voedingssupplement innemen? [TIME SEARCH]

Antwoord: *Ja, alhoewel Anna een verhoogd risico heeft op bijwerkingen, is dit is mogelijk als de arts de situatie heeft bekeken en het voedingssupplement daarna heeft voorgeschreven*
Observatie zoeken:

Vraag 3
Welke stappen moet je nemen als Anna teveel van het voedingssupplement heeft ingenomen? [TIME SEARCH]

Antwoord: *De ouder hoeft in principe niks te doen, alleen een oogje in het zeil houden op bijwerkingen. Als Anna bijwerkingen vertoont dan is het noodzakelijk om de arts of apotheker te contacteren*
Observatie zoeken:

Vraag 4
Welke informatiebron moet je volgen en vertrouwen als verschillende geschreven bronnen niet dezelfde informatie verstrekken? [TIME SEARCH]

Antwoord: *De volgorde is 1. medicatielabel, 2. bijsluiter, 2. bijgeleverde folders*
Observatie zoeken:

Vraag 1
Op welke verschillende manieren kun je het voedingssupplement toedienen aan Anna? [TIME SEARCH]

Antwoord: *Anna kan de tablet kauwen met haar tanden, het kan opgelost worden in haar drinken of het kan gemixt worden door het eten.*
Observatie zoeken:

Vraag 2
Stel dat Anna als baby een hartoperatie heeft ondergaan en daarom is geïdentificeerd als een hartpatiënt, kan Anna dan dit voedingssupplement innemen? [TIME SEARCH]

Antwoord: *Ja, alhoewel Anna een verhoogd risico heeft op bijwerkingen, is dit is mogelijk als de arts de situatie heeft bekeken en het voedingssupplement daarna heeft voorgeschreven*
Observatie zoeken:

Vraag 3

Appendix H. Research protocol

Welke stappen moet je nemen als Anna teveel van het voedingssupplement heeft ingenomen? [TIME SEARCH]

Antwoord: *De ouder hoeft in principe niks te doen, alleen een oogje in het zeil houden op bijwerkingen. Als Anna bijwerkingen vertoont dan is het noodzakelijk om de arts of apotheker te contacteren*
Observatie zoeken:

Vraag 4
Welke informatiebron moet je volgen en vertrouwen als verschillende geschreven bronnen niet dezelfde informatie verstrekken? [TIME SEARCH]

Antwoord: *De volgorde is 1. medicatielabel, 2. bijsluiter, 2. bijgeleverde folders*
Antwoord deelnemer:

STAP 5. Qualitatieve interview vragen

Vraag 1
Kun je de algehele ervaring beschrijven bij het verkrijgen van informatie via informatiepakket A? (instructies van de arts, etiket van het voedingssupplement, bijsluiter van het voedingssupplement)?

Antwoord deelnemer:

Vraag 2
Zou je kunnen beschrijven of je de manier waarop de informatie in deze bijsluiter wordt weergegeven, dus; *dat het beschreven is met alleen tekst, dat het gecategoriseerd is op informatieonderwerpen, en dat de tekst is onderscheiden door middel van kopjes die onder elkaar staan op één vel papier* als prettig of onprettig hebt ervaren in het begripsproces? Waarom?

Antwoord deelnemer:
Tekst:

Informatie Onderwerpen categorisatie:

Kopjes onder elkaar:

Vraag 3
Zou je de algehele ervaring kunnen beschrijven bij het verkrijgen van informatie via het tweede informatiapakket B (instructies van de arts, etiket van het voedingssupplement, informatiekaarten)?

Antwoord deelnemer:

Vraag 4
Kun je beschrijven of je de manier waarop de informatie in deze bijsluiter wordt weergegeven (tekst ondersteund met visuals), gecategoriseerd (veelgestelde vragen) en de afstand tussen secties (ruimtelijke ordening) als prettig of onprettig hebt ervaren in het begripsproces? Waarom?

Antwoord deelnemer:
Tekst met plaatjes:

Veelgestelde vragen gecategoriseerd:

Ruimtelijke ordening (spatial arrangement):

Vraag 5
zou je in meer detail kunnen beschrijven welke visuele stijl naar jouw mening het beste heeft geholpen in het begrijpingsproces, waarbij je de realistische visuals vergelijkt met de omlijnde visuals in bepaalde kaarten? Waarom?

Antwoord deelnemer:

Vraag 6
zou je de ervaring kunnen beschrijven van het plaatsen van de eerste 5 kaarten in de kaarthouders en de mogelijkheid om tijdens de het lezen van de rest van de kaarten hier naar terug te kijken?

Antwoord deelnemer:

Vraag 7
Kun je de het verschil beschrijven van het terughalen van informatie binnen informatiepakket A en informatiapakket B (juiste antwoord zoeken), welke elementen hebben geholpen bij het terugzoeken van de informatie en welke elementen vormden een obstakel?

Antwoord deelnemer:

Vraag 8 (goud)
Zou je met behulp van deze klemmen aan kunnen geven welke kaarten, naar uw mening, zeer begrijpelijk zijn? Leg alstublieft uit waarom je deze kaarten hebt gekozen.

Antwoord deelnemer:

Vraag 9 (zilver)
Zou je met behulp van deze klemmen aan kunnen geven welke kaarten, naar uw mening, verbeterd kunnen worden voor een beter begrip? Leg alstublieft uit waarom je deze kaarten hebt gekozen.

Antwoord deelnemer:

Appendix I. Research answers

Questions during research

Background questions

Question 1.
Are you a parent who currently does not have any children below the age of 16? (*If yes - continue with research)*

P1: Yes
P2: Yes
P3: Yes
P4: Yes
P5: Yes
P6: Yes
P7: Yes

Question 2.
What is your nationality?

P1: Dutch
P2: Dutch
P3: Dutch
P4: Dutch
P5: Dutch
P6: Dutch
P7: Dutch

Quantitative test questions [Pakkage A]
(correct answer depending on if the answer matches the description of the medication leaflet - test understanding)

Question 1.
Can you tell me what the correct dosage is for the child, and for how long you should administer this dosage?
***Answer**: 1 tablet per day, for the duration of 22 days*

P1 (incorrect answer): For a 5-year-old child, it was one tablet, I believe for 20 days
P2 (correct answer): 22 days, one tablet of 40 mg
P3 (correct answer): 1 tablet for 22 days
P4 (correct answer): 22 days, 40 mg, 1 pill per day
P5 (correct answer): 1 tablet per day, 22 days
P6 (correct answer): 1 tablet per day for 22 days
P7 (correct answer): 1 pill per day during 22 days

Question 2.
If your child is allergic to parvalbumin (a substance found in fish), is it then allowed to give this dietary supplement?
***Answer**: Yes, that is allowed, as parvalbumin is not present in the dietary supplement*

P1 (incorrect answer): No, in that case, it's best to stop or consult with the doctor
P2 (incorrect answer): Then I consult the doctor. I think that's also stated. Yes, consult the doctor
P3 (correct answer): I think so, it's not listed here. It's not listed in the content of the tablet
P4 (correct answer): I don't know, I think so, I didn't see it there.
P5 (correct answer): Yes you can do this because it is not in the tablet
P6 (incomplete answer): Yes
P7 (correct answer): You naturally have a continuous reference to..., that's not practical. It's very hard to read. But that substance from fish is not listed here, so you are allowed to give it

Question 3.
Suppose a friend is visiting to play with your child, would you be allowed to give this dietary supplement to the friend as well? Why or why not?
***Answer**: No, that is not allowed because the prescribed dietary supplement is child-specific and based on age, weight, and health condition*

P1 (incorrect answer): No, because she probably has enough magnesium. If you consume too much of it, it also has side effects, so that is not allowed.
P2 (incomplete answer): Of course, I wouldn't give this to a friend. Because this is for my daughter Anna, who is 5 years old. I would never give medication to other children.
P3 (incorrect answer): Not, because you don't know if she has allergies. And you also don't know if she has heart and kidney problems, as that would pose a higher risk.
P4 (incorrect answer): Not really, because it's only for a small child
P5 (correct answer): Do not give the tablet, as there has been a specific focus and examination of... what was it... health, weight, I think... and age
P6 (correct answer): No, that is not allowed because it is child-specific and based on what was it.. age, weight, and health condition
P7 (incomplete answer): Mumbles: "Is it mentioned in the side effects..." Here it states that it can only be administered to a specific child, so you are not allowed to use it

Question 4.
Suppose four days into regularly administering the dietary supplement to your child, you observe that your child is unusually fatigued throughout the day. Could you provide an explanation for this, and should any action be taken?
***Answer**: This can be noticed because it is listed as one of the side effects. In this case, the parent should contact the doctor or pharmacist.*

P1 (incorrect answer): I think that nausea was listed as a more significant side effect, I don't believe fatigue was included. I think if you're fatigued, it's more likely due to insufficient intake of minerals. I believe this was not listed as a side effect, so they should ask the doctor about this.
P2 (correct answer): Fatigue is mentioned, but I would immediately call the doctor. Indeed, it says, 'some cases of fatigue have been described'.
P3 (incorrect answer): You're not sure if it's the magnesium, and you should call the doctor.

Appendix I. Research answers

P4 (incomplete answer): I don't think so, oh yes, in that case, just go to the doctor
P5 (incomplete answer): Yes
P6 (correct answer): Yes, that is a side effect, and go to the doctor
P7 (incomplete answer): Yes... possible side effects... uhm... palpitations... thirst... low blood pressure... some cases of fatigue... yes, that could be related to the tablet

Question 5.
Suppose you have forgotten to give the dietary supplement to your child for two days, how should you continue with the dosage?
Answer: *Then you should proceed with the next dose in the schedule. The missed dose should not be made up for.*

P1 (correct answer): Then you should skip 2 days and continue with once a day afterward. You should not make up for the missed doses.
P2 (correct answer): You should skip those days and not make up for them, that's stated in the medication leaflet.
P3 (correct answer): Just proceed as if you haven't forgotten anything, so the standard dosage
P4 (correct answer): Simply resume with 1 pill per day.
P5 (correct answer): Then you should continue with the next dose
P6 (correct answer): Just continue with the dosage
P7 (correct answer): "If you have forgotten to give a dose to your child, skip it, and never give a double dose to your child"

Quantitative test questions [Pakkage B]
(correct answer depending on if the answer matches the description of the medication leaflet - as we're testing understanding)

Question 1.
Can you tell me what the correct dosage is for the child, and for how long you should administer this dosage?
Answer: *1 tablet per day, for the duration of 22 days*

P1 (correct answer): For a 5-year-old, 1 tablet per day, for 22 days
P2 (correct answer): 22 days, 1 tablet a day in the shape of a bear
P3 (correct answer): 1 pill a day for 22 days
P4 (correct answer): 1 pill a day and then for 22 days
P5 (correct answer): 1 tablet per day, 22 days
P6 (correct answer): 1 tablet per day for 22 days
P7 (correct answer): Anna is 5 years old, so you should take 1 tablet per day, 22 in a month, so 22 times, for 22 days

Question 2.
If your child is allergic to parvalbumin (a substance found in fish), is it then allowed to give this dietary supplement?
Answer: *Yes, that is allowed, as parvalbumin is not present in the dietary supplement*

P1 (incorrect answer): No, that's not allowed
P2 (correct answer): I would definitely consult a doctor then (before reading the cards). It says here, 'do not give this dietary supplement in case of an allergy to any of the ingredients.' I would then need to find where these ingredients are. Here, this one... is not listed. That substance is not mentioned here, but I would still consult a doctor. In theory, it should be allowed, but I doubt the competence of the pharmacy.
P3 (correct answer): Yes, because Anna is allergic to something that is not in the tablet
P4 (correct answer): Yes, because it's not listed there (points to content card)
P5 (correct answer): Based on these two cards (allergy + Content | substances), yes.
P6 (correct answer): Yes, because Anna is allergic to the substance of fish that you mentioned, and that is not in the tablet
P7 (correct answer): Allergy... not if it's present in any of the content substances... What was the substance? Parvalbumin... Yes, then you can give it

Question 3.
Suppose a friend is visiting to play with your child, would you be allowed to give this dietary supplement to the friend as well? Why or why not?
Answer: *No, that is not allowed because the prescribed dietary supplement is child-specific and based on age, weight, and health condition*

P1 (incomplete answer): No, because this friend probably already has enough of the magnesium mineral, and otherwise, she could experience side effects.
P2 (incomplete answer): No. I don't want to take the responsibility for a child getting sick because I give pills that are meant only for my daughter. Absolutely prohibited, even if it's just a vitamin pill, another child should not receive it.
P3 (incomplete answer): No, because it's prescribed for only this child by a doctor, and that's necessary for this medication.
P4 (incomplete answer): No, because it's specifically prescribed for my child.
P5 (correct answer): I wouldn't give it, based on the cards that are laying here, so it is only intended for what is prescribed by a doctor, it is child-specific and based on weight, health condition, age.. So, I wouldn't dare give it to another child like that
P6 (correct answer): No, in principle... let me see... no, because it's child-specific due to age, weight, and health condition
P7 (incomplete answer): You are not allowed to give it because it may only be administered to the specific child prescribed by a doctor, and in this case, it has not been prescribed by the doctor

Question 4.
Suppose four days into regularly administering the dietary supplement to your child, you observe that your child is unusually fatigued throughout the day. Could you provide an explanation for this, and should any action be taken?
Answer: *This can be noticed because it is listed as one of the side effects. In this case, the parent should contact the doctor or pharmacist.*

P1 (correct answer): Fatigue... oh, it is listed in the side effects (laughter). I couldn't find that earlier. Yes, that is a side effect, so you should contact the doctor.

Appendix I. Research answers

P2 (correct answer): One of the known side effects is that a child may become fatigued, so theoretically that could happen. And then you would need to consult a doctor again
P3 (correct answer): Yes, you should call the doctor, and it's listed here in the side effects, so the magnesium could be the cause
P4 (correct answer): Yes, that's possible, and then consult your doctor or pharmacist
P5 (correct answer): Yes, one of the side effects is fatigue, and it also states that in that case, you should contact your doctor or pharmacist
P6 (correct answer): Yes, that is possible because it is one of the side effects, and you should contact the doctor
P7 (correct answer): Yes, that could be because it is one of the side effects. And you should contact a doctor.

Question 5.
Suppose you have forgotten to give the dietary supplement to your child for two days, how should you continue with the dosage?
Answer: *Then you should proceed with the next dose in the schedule. The missed dose should not be made up for.*

P1 (correct answer): Then you should skip 2 days, and then continue with once a day. You are not allowed to compensate for the missed dose.
P2 (correct answer): Do not make up for it, and the next day again 1 pill, it says so on the 'Forgotten dose' card. By the way, what is not mentioned is whether you should continue on day 23 and day 24 the pills that you missed. Because one rule is 22 pills, and the other rule is that you are not allowed to make up for it. So it is not clear to me what I should do, because the child would then have taken fewer pills than the doctor prescribed.
P3 (correct answer): Just the same. Continue with the dosage as if you haven't forgotten anything and return to the standard dosage, 1 pill per day
P4 (correct answer): Then just start again the next day, with 1 pil each day
P5 (correct answer): I would just continue with the schedule based on this card
P6 (correct answer): In that case, you should just continue, and do not make up for those two days.
P7 (correct answer): Skip this one and proceed with the next dose, but do not take a double dose. So, you are not allowed to make up for those two days

Quantitative questions for recall [Package A]
Can you search the answer and show me where you found it for the following questions?

Question 1.
How can you administer the supplement to Anna, considering different routes?
Answer: *Anna can chew the tablet with her teeth, dissolve it in her drink, or mix it with her food*

Question 2.
Suppose your child has undergone heart surgery as a baby, and is thus identified as a heart patient, is it possible for your child to take this dietary supplement?
Answer: *Yes, although Anna has an increased risk of side effects, this is possible if the doctor has assessed the situation and then prescribed the dietary supplement.*

Question 3.
What steps should you take if Anna has consumed an excessive amount of the dietary supplement?
Answer: *In theory, the parent doesn't need to take action, just keep an eye out for side effects. If Anna exhibits side effects, it is necessary to contact the doctor or pharmacist.*

Question 4.
Which information source should you follow and trust if different sources don't provide the same information?
Answer: *The order is 1. medication label 2. medication leaflet 3. accompanying leaflets*

Quantitative questions for recall [Package B]
Can you search the answer and show me where you found it for the following questions?

Question 1.
How can you administer the supplement to Anna, considering different routes?
Answer: *Anna can chew the tablet with her teeth, dissolve it in her drink, or mix it with her food*

Question 2.
Suppose your child has undergone heart surgery as a baby, and is thus identified as a heart patient, is it possible for your child to take this dietary supplement?
Answer: *Yes, although Anna has an increased risk of side effects, this is possible if the doctor has assessed the situation and then prescribed the dietary supplement.*

Question 3.
What steps should you take if Anna has consumed an excessive amount of the dietary supplement?
Answer: *In theory, the parent doesn't need to take action, just keep an eye out for side effects. If Anna exhibits side effects, it is necessary to contact the doctor or pharmacist.*

Question 4.
Which information source should you follow and trust if different sources don't provide the same information?
Answer: *The order is 1. medication label 2. information cards 3. accompanying leaflets*

Qualitative questions (semi-structured)

Question 1
Can you describe your overall experience in retrieving the information through the first information package (*dietary supplement label, dietary supplement leaflet, and doctor's instruction*)?

Question 2
Can you describe whether you found the manner in which the information in this leaflet is visualized (text only), categorized (information topics), and differentiated between sections (headings) to be pleasant or unpleasant in the understanding process? Why?

Appendix I. Research answers

Question 3
Can you describe your overall experience in retrieving the information through the second information package (*dietary supplement label, information cards, and doctor's instruction*)?

Question 4
Can you describe whether you found the manner in which the information in this leaflet is visualized (text supported with visuals), categorized (frequently asked questions), and differentiated between sections (spatial arrangement) to be pleasant or unpleasant in the understanding process? Why?

Question 5
Can you describe in further detail which visual style you believe best aided in the understanding process, comparing the realistic visuals to outlined visuals in certain sections? Why?

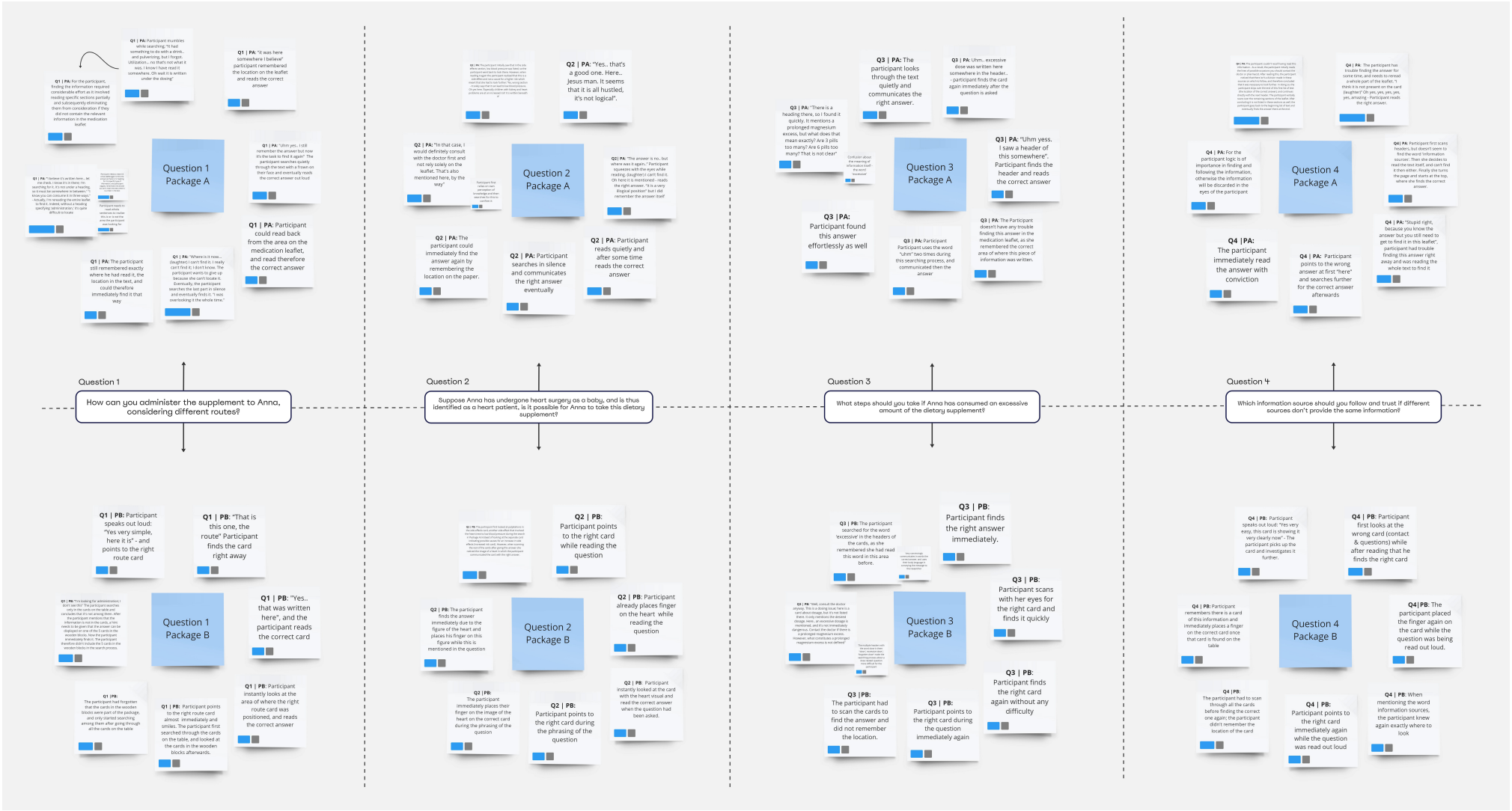
Question 6
Can you describe your experience with placing the 5 cards in the card holders, and the option to be able to look back at these cards during the continuation of the understanding process?

Question 7
Can you describe your experience and the difference in recalling information within information package 1 and information package 2, what elements helped you in recalling the information, and which elements formed a barrier?

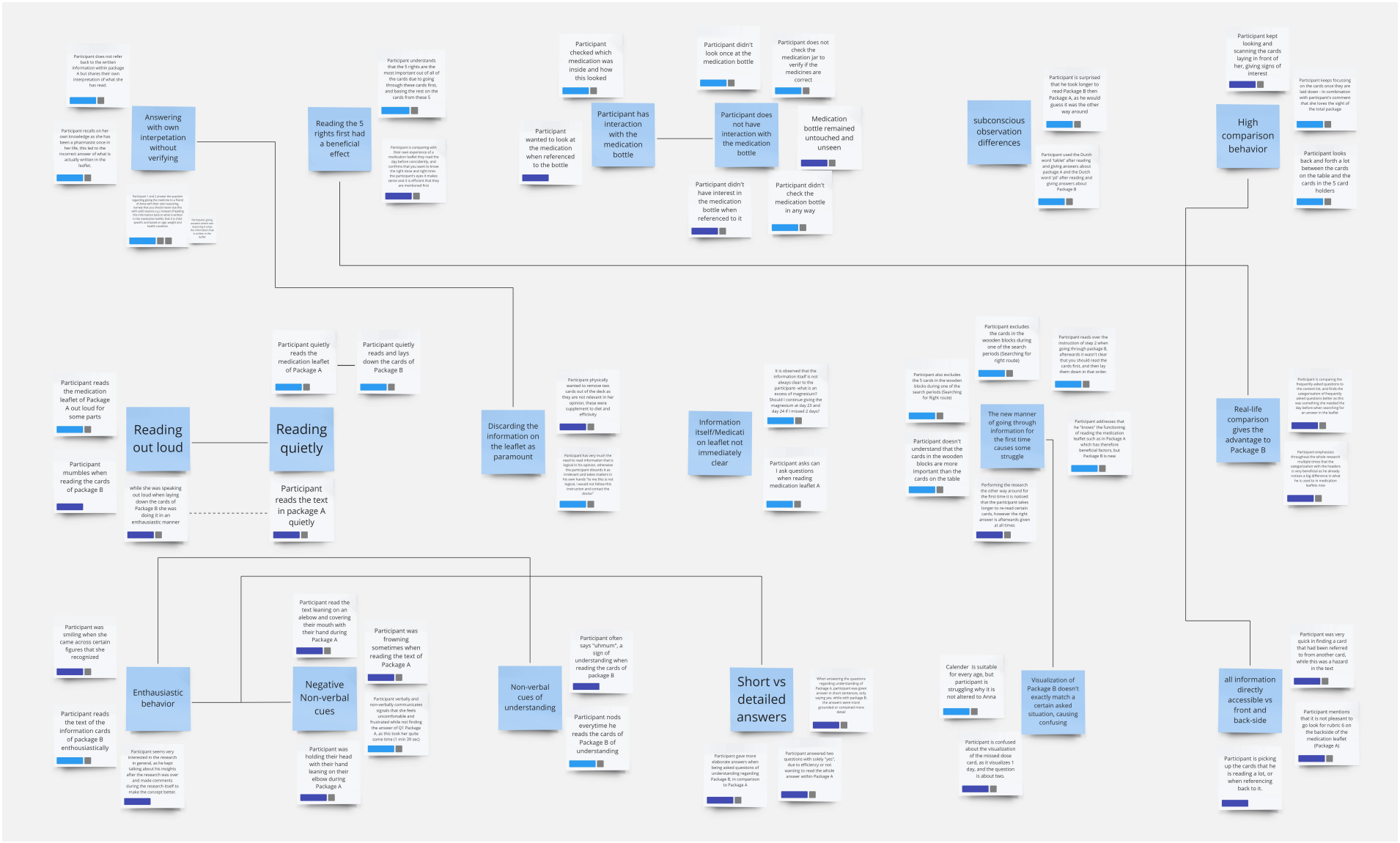
Question 8
Could you use these bulldog clips to highlight which cards, in your opinion, are highly understandable? Please explain why you choose these cards

Question 9
Could you use these bulldog clips to highlight which cards, in your opinion, could be improved for better understanding? Please explain why you choose these cards

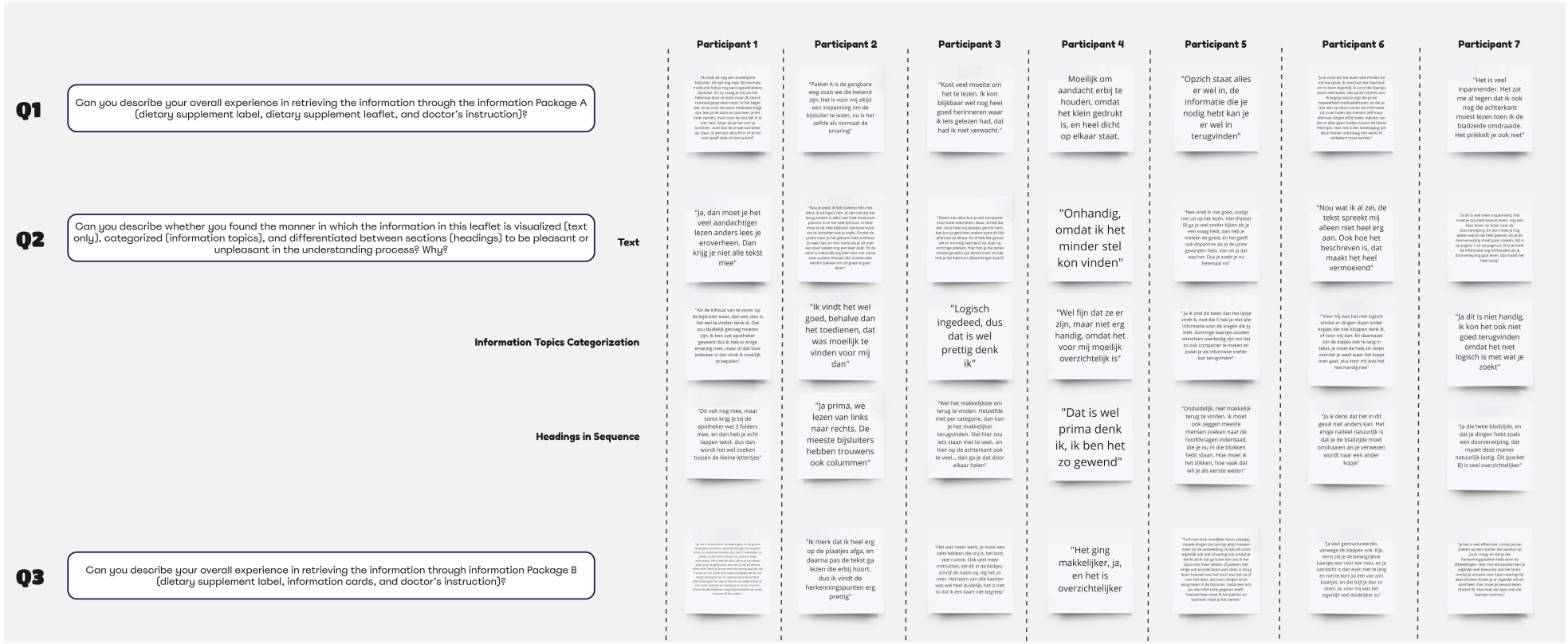
Appendix J. Observations during search period (recall)



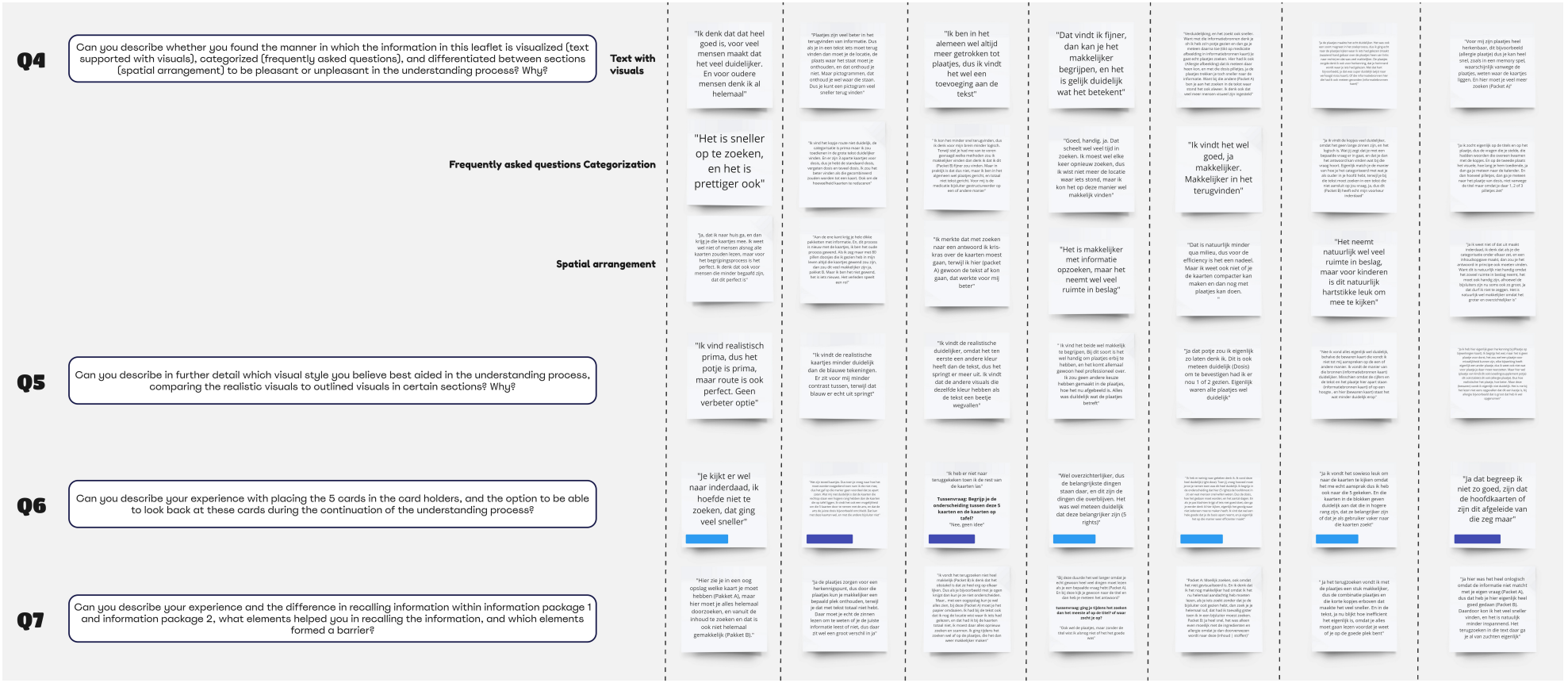
Appendix K. General observations - Thematic analysis indutive reasoning



Appendix L. Interview answers - semistructured



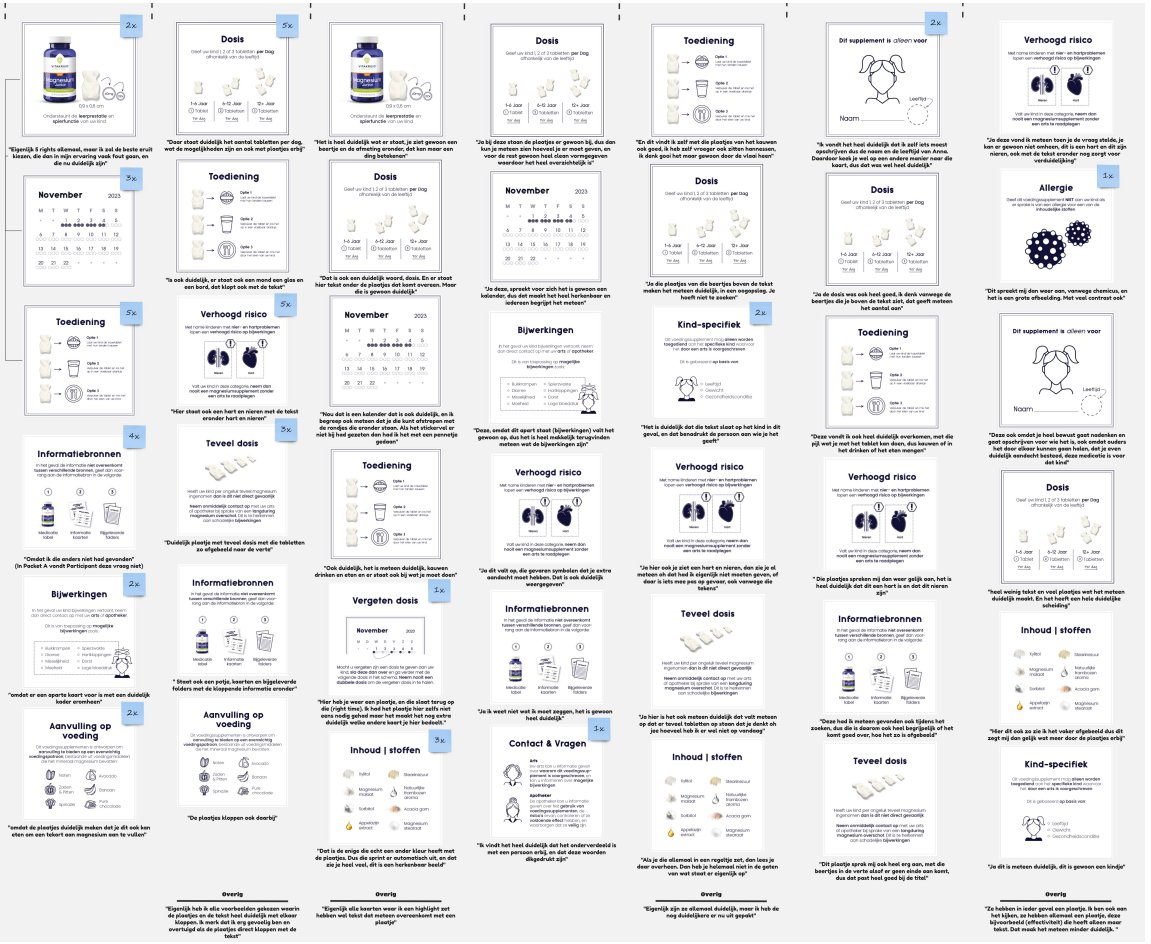
Appendix L. Interview answers - semistructured



Appendix L. Interview answers - semistructured

Q8

Could you use these bulldog clips to highlight which cards, in your opinion, are highly understandable? Please explain why you choose these cards



Appendix L. Interview answers - semistructured

Q9

Could you use these bulldog clips to highlight which cards, in your opinion, could be improved for better understanding? Please explain why you choose these cards

"Geen"

"Je hebt 3 kaartjes met dosis, ik vindt dat je dit een kaartje moet maken. Dat als je het kaartje dosis ziet, dat je dan alles ziet wat daar mee te maken heeft. En ik zou de 22 dagen er hier ook nog eens bij zetten, naast de sticker kaart"

"Dit plaatje spreekt me totaal niet aan, en ik begrijp niet dat hier gevaar in zit. Dus ik zou eerder een rode rand of een signaal van gevaar toevoegen, zodat mij je in een stress-situatie zit dat je in de kaarten kijkt en iets roods ziet, en dat je dan meteen daar op kijkt. Of een rode grafiek met een pijl omhoog -stijgen"

"Ik vindt dit gewoon teveel tekst. Dit had je ook met 2 plaatjes, van een spier, een bot en een tand kunnen weergeven. Dat had veel krachtiger zijn geweest"

"Het woord vindt ik niet goed passen. Ik zou het woord volgende erbij zetten, omdat dat de essentie is voor mij. Het doel van het kaartje weergeven."

"Ik weet nog steeds eigenlijk niet wat hier op staat, ik vindt dit een hele onduidelijke. Het spreekt mij niet aan, het is voor mij niet logisch. Ik denk dat het weer teveel tekst is. Of andere plaatjes, zoals een thermometer bij temperatuur"

"Geen, ik vondt alles duidelijk"

"Omdat ik met de 2 dagen zat te hennesen, bijdraaier moet het voor mij er echt op staan, en kan ik het minder goed aflezen van een algemeen plaatje"

"Hier zou ik de inhoudelijke stoffen nog bij zetten, zodat je niet hoeft te zoeken naar een ander kaartje, dat je as bijvoorbeeld wat kleiner in de hoek naar zet, en het plaatje van de allergie wat kleiner

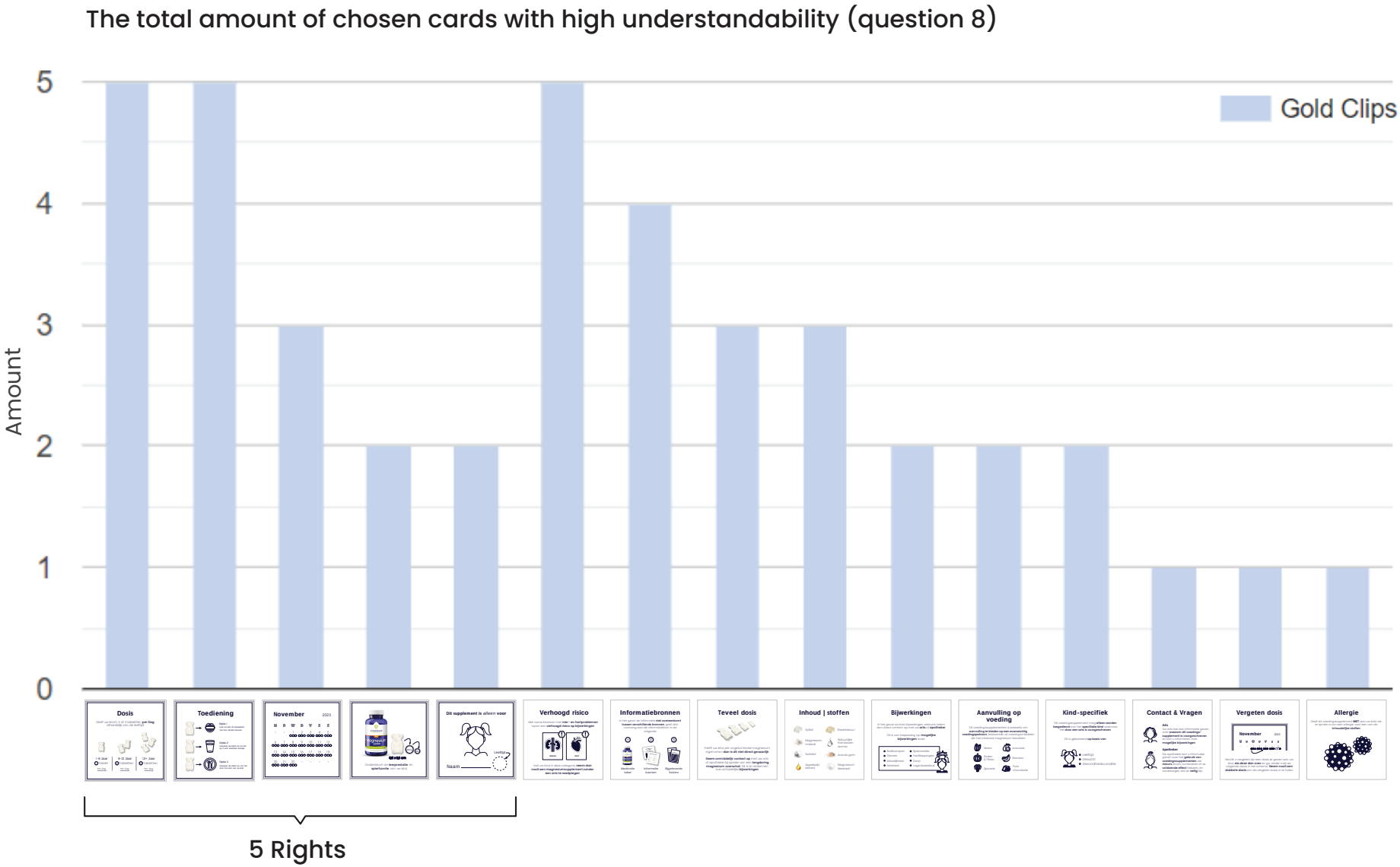
"Deze vondt ik ook niet helemaal duidelijk, ik vondt het op de een of andere manier in de andere bijsluiter duidelijker overkomen"

"Ik denk dat het niet in een oogopslag duidelijk wat de informatie is denk ik. Ik moet nog teveel lezen en er uit te halen wat de bedoeling is, of wat er staat. Misschien als het op een andere manier is neergezet dat het dan beter is."

"Evenwichtig voedingspatroon.. ik denk dat heel veel mensen niet weten wat dat is. Het is voor mij hier ook niet duidelijk waarom je dit moet weten, kun je bijvoorbeeld dit vervangen door geneeg te eten van avocado's, en haaveel dan, of moet je het altijd samen hoeveel je ook eet hiervan. Het is niet duidelijk wat de extra is hierachter"

" De opmaak van het kaartje is voor mij niet duidelijk, of het minst duidelijk van allemaal."

Appendix M. Question 8 - Boxplot chosen cards gold clips



Appendix N. Question 9 - Boxplot chosen cards silver clips