

# Putting the Kit in Toolkit

To Design a Physical Toolkit that contributes to Creative Sensemaking for People with Autism in Designing their own Tools

MSc Thesis by Mika van Duijn

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To Design a Physical Toolkit that contributes to Creative Sensemaking for People with Autism in Designing their own Tools

Master Thesis

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What stands out to me in particular is his stance and advice on how to write a thesis. My experience with the bachelor thesis was tainted by the 2020 pandemic, and as such I never really had the feeling that I truly knew what I was doing. Working from home, never meeting my supervisors in person, and the thesis being primarily comprised of literary research put a big damper on being able to express creativity and design throughout the process. As such, I came into the master thesis with rigid expectations of what a thesis should look like, to the point of being paralyzed by the amount of 'rules' I had to adhere to and struggling to put any words on paper. I remember having a long conversation with Jelle where he essentially took away those shackles, and instead assured me that there is no 'perfect' way to write a thesis. Creativity is a virtue. He inspired me to write 'my' thesis, a thesis that could only be written by me, and to essentially tell the story of how I designed this one thing in the way that I would like to tell it. This really helped get me going, and writing soon became an exciting aspect.

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# Abstract

Young adults with autism (YAWA for short) can use tools to help face challenges that people without autism may never face. For example, one might use a stress ball, while another may use a small notebook. However, there is value to be found in facilitating YAWA to design their *own* tools. Autism is heterogeneous in nature, so every YAWA will have different wants and needs. As the foremost expert in their own experience, YAWA can bring valuable input to a design that is meant to cater to them specifically. The Design Your Life project (DYL) has created a toolkit that facilitates this very concept. The user, along with a co-designer, are guided through a design process from start to finish, with the goal of designing a product that is made for, and made by the user.

The DYL toolkit is built upon a strong foundation of research, and as such contains a variety of well-researched and tested methods to guide the user through the design process. However, the physical form and presentation of the toolkit still has ample room for improvement. While steps have been made to shape the toolkit in a way that works on a base level, there is still much untapped potential. The goal is to redesign the toolkit to bring its physical representation up to the level of its content. A strong root in both building for autism as well as theories of embodied sensemaking can help sprout a redesign for the physical form of the toolkit that could truly resonate with its userbase. In doing so, the toolkit itself can communicate the theoretical content of the DYL design process to the user on a deeper level, and spur creative and conceptual thinking.

The toolkit is used as a case to center the theoretical research questions, in which I ask how physical form-giving can contribute to creative sensemaking, specifically in the frame of assisting YAWA to create their own tools. Using Research Through Design as the main methodology, I created three chronological iterations of toolkit redesigns. These iterations are grounded in an extensive analysis of the current DYL toolkit, research on how to design for autism, and a design framework based on embodied sensemaking. This framework proposes three roles that a toolkit can fulfil to move past an ordinary artefact that merely represents the thinking process (i.e. a whiteboard, or an agenda), to become something that stimulates deeper and creative thinking.

Each iteration was evaluated with a different group of evaluators, and given feedback was fed into the next iteration. In the end, a hi-fi redesign of the DYL toolkit was made, aiming to resolve existing problems with the current toolkit, cater towards an audience of YAWA, and incorporating the embodied sensemaking framework. The last redesign was evaluated with two YAWA that are unfamiliar with the DYL project, where they shared their thoughts and opinions on what aspects meet its goals, as well as denoting potential room for improvement.

A limitation of this research is that it explicitly does not address the role of a co-designer. The DYL project is designed for usage by a YAWA along with a co-designer, so this leaves room to explore how the role of a co-designer can affect the physical design of the toolkit. This raises another topic, in which the co-designer may or may not have autism themselves. As such, one can question to what degree a toolkit

should be designer for YAWA, without potentially diminishing the experience of a neurotypical person.

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# 1 Introduction

*“Class was ending, and Mary couldn’t be more thrilled. Her classmates had become more and more noisy as the school day neared its end. Mary had a lot of difficulty concentrating as a result of this noise. She is experiencing sensory overload, in which outside stimuli simply become too much for someone to tolerate, making it hard to concentrate or think. The loud voices around her were becoming unbearable.*

*To cope with this, Mary reached into her backpack and pulled out her favourite stimming tool—a small, squishy stress ball. Its soft texture and tactile material provided her with a calming outlet. She held the ball in her hand, rhythmically squeezing and releasing it, focusing on the repetitive motion and the soothing sensation it brought. Although she much preferred the classroom to simply be quiet instead, for now, this helped her to deal with the noise.*

*The bell rang, and she was quick to pack up her belongings and leave the classroom. When arriving at the exit of the school, she could see her mom in the distance, waiting in her car. Every so often, her mom would pick her up if she could. When Mary entered the car, her mom could see the tired look on her face. She knew to turn down the radio to the point where it sounded like a whisper in the background. On days like this, Mary preferred to enjoy her car rides home in silence. She was thankful that her mom immediately picked up on her mood. Over the years, she had learned that Mary wasn’t being grumpy or antisocial, she simply needed to wind down a little more than most kids. When they would arrive home, she would tell her all about her day, but for now, they simply enjoyed a peaceful ride home.”*

## 1.1 The Challenge of Autism

Mary is a young adult with autism<sup>1</sup>, hereafter referred to as YAWA (young adult(s) with autism). For now, in this context, it is most relevant to know that YAWA typically face some struggles in life that most people do not face. This is a result of perceiving the world differently than neurotypical people (people without autism), and as such they act upon their perception differently than a neurotypical person might (De Jaegher, 2013; Fletcher-Watson & Happé, 2019). Mary’s scenario is an example of how YAWA have to cope and circumvent these struggles on their own accord, with this anecdote denoting an example of sensory overstimulation. Sensory overstimulation refers to a person being overwhelmed by sensory input, i.e. visuals, sounds or touch (Pellicano, 2013). There are a variety of ways that YAWA can deal with these kinds of struggles. One could try to simply endure these struggles, although not always without consequence. Research has shown that YAWA *not* addressing their unique wants and needs is linked to increased rates of anxiety and most notably depression (Hollocks et al., 2019). Another method to deal with these

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<sup>1</sup> In literature, “People with Autism” and “Autistic People” are used interchangeably. That said, when interviewed on the topic, young adults with autism and their parents voice their preference for the former (Buijsman et al., 2023). This thesis primarily addresses young adults with autism, and as such, I choose to exclusively use “People with Autism”.



daily struggles is to avoid or escape situations in which these struggles can arise. However, especially in more severe cases, this can lead YAWA to socially isolate themselves. This, again, is linked to anxiety and depression (Hollocks et al., 2019). Autism as a condition is further introduced in chapter 3.2.

A third method is to use a tool, a ‘supportive technology’ to help ease the struggle, or even turn it into a pleasant experience (van Dijk et al., 2019). Lang et al defines this as “...*any device or piece of equipment that facilitates teaching new skills, augments existing skills, or otherwise reduces the impact of disability on daily functioning.*” (Lang et al., 2014). Assistive Technology is found to have a positive effect on YAWA dealing with their autism-related wants and needs (O’Neill et al., 2020). The stress ball from the above anecdote is one such example of a piece of assistive technology. In this paper, I will be focusing on these types of assistive technology, henceforth referred to as simply ‘tools’.

## **1.2 Autism and Tools**

There is one major challenge when it comes to designing tools for autistic users. Since everyone experiences autism differently (Happé et al., 2006), it becomes very difficult to develop or assign tools specifically targeted at this user group (De Jaegher, 2013; Spiel et al., 2016). Whereas Mary’s tool is a physical and tactile object that stimulates her touch, another person might really dislike anything touch related, preferring a vision-based tool instead. In addition, there is the case of hypo- versus hypersensitivity, where YAWA can experience sensory input more or less intensely compared to a neurotypical person (Baron-Cohen et al., 2009). Mary was easily overwhelmed by sound, but adding an additional touch stimulus was actually a very therapeutic experience for her. This can be completely different from person to person (van Dijk et al., 2019). Lastly, the solution does not even need to be a physical tool. Referencing the anecdote again, Mary’s mother turning down the radio in the car can be considered a ‘tool’ as well. It is an act of service that is provided by someone in her direct environment to make her experience in life easier and more pleasant. This only further broadens the scope of what the ‘ideal tool’ might look like for YAWA<sup>2</sup>. As such, combining these factors together, one can conclude that there is no one-size-fits-all solution to address the daily struggles that YAWA may experience.

## **1.3 Designing Tools**

There is no one-size-fits-all solution to address the daily struggles of YAWA (Happé et al., 2006). Therein lies opportunity, however. Since everyone has their unique struggles and preferences, there is a case to be made about allowing YAWA to design their own solutions. After all, from a practical perspective, who better to design these tools than the experts on the situation; themselves? Allowing YAWA to design their own tools allows one to circumvent making ‘generic’ tools, and allows them to make

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<sup>2</sup> In this thesis, the focus lies specifically on physical tools, a.k.a. assistive technology. This is done to help reduce the scope of the research, but also because the goal of the research specifically addresses physical form-giving and interaction.

something that truly caters to their unique wants and needs (Frauenberger et al., 2019; van Dijk et al., 2019). On the ethical side, there is also something to be said about giving people the opportunity to design their own tools in the first place. If neurotypical people have access to tools that fit their needs (or are presented situations in which they do not even need any tools at all), then YAWA should deserve to have access to tools that cater to them as well. If those tools are absent, then YAWA should at least be empowered and assisted in making their own. Another argument to be made is that perhaps YAWA should be involved in the making of ‘content’ directed at YAWA. Especially in a world where autism is often seen as ‘other’, the morality of neurotypical people creating tools for YAWA to fit into the neurotypical world can be questioned, even if well-intended. Especially in recent times, the argument that autism itself deserves its own spot in society, rather than being excluded from it, has gained traction (more on this in 3.2.4).

This approach is accompanied by a major obstacle however, and that is that not everybody is a designer. A solution that can help overcome this obstacle is to pair the designing YAWA with a co-designer that helps guide them through the design process, wherein the design process becomes ‘participatory design’ (hereafter PD). PD is a designing method wherein the user is directly involved in designing the technology they use, accompanied by a secondary party (Simonsen & Robertson, 2013). Prior research concerning the viability of YAWA designing their own tools specifically analysed situations in which PD was the main design method (Frauenberger et al., 2019; van Dijk et al., 2019).

#### **1.4 The “Design Your Life” Toolkit**

Design Your Life (hereafter DYL) is an ongoing research project all about facilitating YAWA in designing their own tools through co-design (Waardenburg et al., 2021). The main product that this research has produced so far is a ‘toolkit’, a material artefact which purpose is to assist YAWA and their co-designer in going through the design process (see figure 1). This toolkit is thoroughly dissected and analysed in chapter 3.1. For now however, it is relevant to know that the toolkit provides the users with explanations regarding the purpose of a ‘self-designed’ tool, structural methods to figure out what that tool might look like, guidelines and advice on how to construct that tool, and methods to help the user reflect on the design process. It also contains some physical tools to help shape a prototype of what a solution can look like, although to a limited degree, which is also further analysed in 3.1.



Figure 1: The DYL toolkit

The DYL toolkit has been an evolving work in progress since February 2020 (‘About Design Your Life’, 2019). These iterations have been mostly focused on the content, to provide the means and the guidelines to theoretically provide the best designing experience for the users. As such, the philosophy and the content that the toolkit uses can be considered sound. The idea of viewing design as a cyclical process, being able to see oneself and one’s actions from an outside perspective, and understanding oneself and one’s needs on a deeper level; these are all concepts that are supported by the current content of the toolkit. Not only have they been refined over time by multiple experts in the field working on the project, it has also been tested with a relevant user group (Huizen et al., 2022). In addition, further testing is currently being done. In this thesis I will mainly focus on the physical design, as it was found to have more room for improvement compared to the theoretical content.

There is still a lot of unexplored potential in the physical form of the toolkit. After all, the toolkit is the link, the delivery vessel between the theoretical content and the creative sensemaking process of the user (and their co-design partner). In its current iteration, the physical toolkit only fulfils the role of an ‘information communicator’ on a very basic scale. The toolkit outlines the steps that the user should take, but it fails to further spur creative and conceptual thinking, to push the user past simply completing the current task at hand and moving on to the next. As much as the methods and philosophy of the project are woven into the content, it simply does not come across to a user that is unaware of the project beforehand.

Rather, the toolkit reads as a step-by-step plan to learn about a basic design process. For the toolkit to reach its full potential, its physical form can and should push past that (Van Dijk, 2023). It should help to user in truly understanding the design process on a deeper level, in addition to understanding what a tool means to them, and what it could/needs to be. To circle back, the link between the theoretical

content and the user's sensemaking is currently there, but bare-bones. The physical representation of this link is the toolkit, so it only makes sense that the key to strengthening this link is the physical toolkit itself. An important aspect to note here is that this thesis merely addresses the physical toolkit, seeing as a digital version is currently in development. Another limitation of note is that while the DYL toolkit is designed for and meant to be used by a YAWA along with a co-designer (i.e. a parent, caretaker, or nurse), I will not be focusing on the involvement of a co-designer in this thesis. This is because this thesis centres the relationship between YAWA, tools, and design. Involving the co-designer goes beyond this scope.

### **1.5 Artefacts to assist a Design Process**

It is commonly known in PD that concrete, material artefacts<sup>3</sup> can be beneficiary towards stimulating and supporting collaborative sensemaking (Sanders et al., 2010; Van Dijk, 2023). Collaborative sensemaking in this context refers to the way that the YAWA user and the co-designer can understand and work on the design challenge and a potential solution together. Van Dijk claims that the common ground between concrete, material artefacts in different contexts of PD seem to be in the mechanism of external representation. The artifacts are seen as storage units, a place to track and compare past findings, as well as instructing the user towards the next step. He proposes that perhaps this point of view is incomplete, and that concrete artefacts also fulfil other roles in the collaborative sensemaking or cognition. This is based on the understanding that an external representation, in addition to functioning as a storage of past (mental) work, can enhance cognitive power and in fact help people think more powerfully than they would be able to *without* such an external representation (Kirsh, 2010, 2013). Van Dijk then views these external representations through the lens of embodied sensemaking and is able to denote an expansion of roles that one such artefact may fulfil. Specifically;

- Role 1: Things play a productive role in the formation and sustainment of sensorimotor couplings, or in other words: things figure in our skilful ways of dealing with the world.
- Role 2: Things function as attunement anchors in participatory sensemaking, a self-organizing process taking place between people.
- Role 3. Things become part of the lifeworld, which provides a necessary contextualizing background to all sensemaking. (Van Dijk, 2023)

These roles provide a practical framework that can work as the foundation for improving the toolkit. That is not to say that the current toolkit cannot fulfil these roles at all. Yet, by *explicitly* focusing on fulfilling these roles during iteration, we can end up with a design that is specifically built to account for and stimulate creative embodied sensemaking, rather than a design that implicitly connects to some aspects of it.

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<sup>3</sup> In literature, "Artefacts" are also referenced to as "Concrete Material Objects" (Van Dijk, 2023) or simply as "Things"(Kirsh, 2010, 2013; Van Dijk, 2023). Examples include markers, projectors, and talking sticks. Abstract concepts such as methods or philosophies are excluded.

To give an example of a project that moves beyond simply external representation, van Dijk presents the “Floor-IT” (see figure 2), a setup in which the users’ ideas are projected onto the ground. These projections can then be interacted with using feet gestures. The purpose of this artefact is not (merely) to store knowledge, but to help guide the conversation. The DYL toolkit is analysed through this lens, which will be further elaborated upon in chapter 3.4, in addition to other theories and analyses on how physical artefacts can help people think creatively and collaboratively, in ways that go beyond providing information displays.



Figure 2: The “Floor-It” (Van Dijk, 2023)

## 1.6 Experiencing the Toolkit through Autism

The last wrinkle to explore is how autism comes into play when considering how the users experience the toolkit. Autism affects how people perceive and interact with the world around them, and the toolkit is no exception to this. As such, one might think that the design of the toolkit should be catered towards people with autism specifically. While this would logically make sense, designing the perfect toolkit for YAWA is impossible because of the aforementioned sheer differences in the way that they experience the world (Happé et al., 2006). In fact, DYL tries to address this very concept, seeing as the perfect tool for every person with autism does not exist. This in turn applies to the toolkit as well. Either we present a wide variety of different toolkits in hopes that everyone can find the ‘right’ one, or we allow the user to design/alter their own toolkit. This quickly becomes a spiral, as we would then be asking the user to design their own toolkit in order to help design their own tool. To avoid this, one can try to address more common traits found in YAWA to a certain point. There are indeed ‘some’ guidelines on how to design for people with autism in general that can be applied, and the toolkit can have some room for alterations and tinkering. The degree to which this can be done will be further elaborated upon in chapter 3.4. After all, DYL already asks the user to design their own tool instead of providing it, so we can at least provide a *toolkit*.

## 2 Research Questions

The main goal of this research is to enhance the current DYL toolkit on a physical component level. The toolkit already contains comprehensive, creative and well-designed tools, but the effectiveness of these tools are gated by the toolkits' physical form. This physical form needs to be brought up to standards of the theory that the toolkit contains. This is done by analysing and re-designing the physical form through the aforementioned lens of embodied sensemaking (Van Dijk, 2023). The secondary goal is to target this design towards YAWA. After all, they are the primary userbase; the main designers. Something to note is that, although the DYL toolkit does have a digital component, this research focuses exclusively on the physical component. The tertiary goal is to make the most of this aspect by trying to fully tune into the advantages and limitations that an exclusively physical medium brings with it. These goals should be able to be achieved by through answering the following questions.

### *Main Research question*

How can physical form-giving contribute to creative sensemaking in assisting people on the autism spectrum in designing their own tools?

### *Sub questions*

1. How can a physical artefact assist creative sensemaking?
2. How can the lens of embodied sensemaking help expand the toolkit?
3. To what degree does autism affect creative sensemaking and physically experiencing the toolkit?
4. Given the answers to questions 1, 2, and 3, how can this be materialized in the form of an evaluable prototype?

## 3 Analysis

### 3.1. Design Your Life (DYL)

Design Your Life is a research project (2020 – 2024) funded by NWO and SIA-RAAK, involving the University of Twente (NWO lead) as well as HAN University of Applied Science (SIA-RAAK lead) (Breeman, 2022). Researchers from both organizations work on this project together. In a world with a thousand-and-one different tools for YAWA to help them navigate their daily lives, DYL allows them to create their own tools instead. This is ultimately the goal of DYL, to provide YAWA with the means to create the assistive technology that specifically caters to them. DYL uses a Research-through-Design methodology, a methodology that I also use in this thesis, which is further elaborated upon in 4.0.

The DYL design-toolkit is a material artefact that allows YAWA to design, create and iterate on their own personal assistive technology (see figure 3). This is done through PD, in which the YAWA works together with a design partner whose role is to help guide them through the design process.



Figure 3: The current DYL toolkit; unpacked

#### General Structure

The way that the toolkit works is that the users are guided through a 6-phase design process, starting with analyses on their current situation and ending with their solution.

#### 1: My Situation

The first phase is all about self-analysis. The largest phase, it contains a multitude of tools in the form of card games and canvases. Completing this phase allows the user

to thoroughly map out their current schedule, habits, surroundings, etc. This provides a strong foundation to build onto during the following phase, as it translates something that can be perceived as ‘vague’ or ‘taken for granted’ into something very concrete and tangible.

## *2: My Focus*

After building a wide foundation during the ‘*My Situation*’ phase, ‘*My Focus*’ follows up on that by narrowing down the scope to build a concrete and specific focus. It is the smallest phase in terms of content, but it can be a daunting task for the user to funnel the potentially overwhelming amount of information from the last phase into a singular focus. As such, this phase contains tools that address that need specifically, resulting in the user having a clear objective to enter the next phase with. This could be a desire to solve a problem in their current situation or to ease current burdens. Another option is to introduce new exciting or helpful aspects in their life that bring a positive influence, rather than trying to resolve/reduce existing negative influences.

## *3: My Ideas*

With a clear focus as a starting point, ‘*My Ideas*’ is the phase in which the user is encouraged to take that focus and start ideating on potential solutions. It does contain tools and canvases that help the user think broadly and to stimulate creativity, but this is the point in the DYL process in which much of the content starts to sprout from the user rather than from the toolkit. After completing this phase, the user should have a wide selection of ideas that address their focus.

## *4: My Solution*

Similar to the first two phases, ‘*My Solution*’ is a follow up on the ‘*My Ideas*’ phase, helping the user funnel their broad range of ideas into a singular solution. It contains the tools to help the user isolate the ideas that truly address their focus, as well as being (reasonably) feasible to construct according to their imagination. This is also the phase in which the solution is produced. Since the solution could be anything, it is mostly focused on providing the user with the resources to find their production needs. This can be through finding if the solution is already on the market, or finding the right people or the right avenues to make their solution happen.

## *5: My Test*

‘*My Test*’ is all about testing the solution made in the previous phase. What this process looks like is completely dependent on the type of solution that the user created. As such, the toolkit attempts to provide guidelines on how to test depending on form that the solution has taken, i.e. a physical product, a system, a service or a mindset. Essentially, it helps the user track their thoughts and feelings as they step into a life with their solution.

## *6: My Insight*

The last phase is a reflective phase in which the user reviews their test data. They will discuss and conclude on whether the solution addresses the focus in a sufficiently meaningful way. On a grander scale, it also encourages the user to reflect on whether their focus might have changed throughout the process, or whether the user has



learned new things about themselves throughout the process. DYL is a cyclical process, and these conclusions add new and important feedback that can be analysed through the *'My Situation'* phase again during a potential second design process. Ideally, the user ends up with the solution to their focus, and has learned more about themselves, how they function, and how they want to shape the world around them.

### **Contents of the Box**

The current DYL toolkit is a box that contains the necessary elements for two co-designers to work through the design your life process. It contains a large playing board, illustrating the cyclical 6-phase process through hexagons (see figure 3). Each of these hexagons contain a satchel which can store relevant conclusions for the corresponding phases. In addition, the toolkit contains markers which can be used to write on top of these satchels. To help the user get started and guide them through the process, the toolkit contains a bundle. This bundle can be seen as the core of the toolkit. It includes information about DYL as a whole, introducing the user to learn about both the project as well as the toolkit itself. More importantly, it contains a multitude of 'tools' corresponding with each of the six phases.

### **Card Packs**

For example, one of the tools in phase 3 (*'My Ideas'*) is the *"Eisen en Onderdelen"* (Demands and Components) card set (see figure 4). It includes two sorting cards. The *"Mag"* (could/may) card represents any aspects of the future solution that are desirable but not required. The *"Moet"* (must) card on the other hand represents aspects that are non-negotiable. It is up to the user to sort the other cards among these two categories. These other cards are based on the users senses. For example, one says *"Hearing: I can adjust the sounds myself"*, whereas another says *"Smelling: My solution smells good"*. The card set is somewhat limited by nature, since it could never describe the traits of all possible solutions in all possible situations. As such, the user is not required to sort the cards that may be irrelevant to their situation, and they also have the option to write down their own requirements on blank cards. The purpose of this tool is to help guide the user towards coming up with ideas. By focusing on their needs, the user may be inspired to start coming up with a design because are aware of some aspects that the solution should or could have.

Another example of a tool using a card pack is *"Mijn Ervaringen"* (My Experiences), which is part of phase 1 (*'My Situation'*). In this case, the cards primarily function as some kind of notebook, allowing the user to write down their daily activities onto the cards. The user uses the filled-in cards to reflect on their situation at a later point. In this case, the cards are not the tool itself like in the first example, but they instead are the medium that the tool uses.



Figure 4: Examples of card sets

Most of the tools in the DYL toolkit use card sets as a medium. That said, as alluded to in the two examples, the cards may fulfil different purposes depending on the tool. Something to note is that the toolkit should not be seen as a game. With a box, a playing board, and multiple sets of cards, it can come across as a cohesive kit where these the playing board and the card sets are all used in one coherent ‘game’, but this is not the case. Rather, each card set is its own separate entity. The playing board is not used like similar-looking games, such as Monopoly or Risk. In these games, the playing board acts as a necessary ‘table’ on which the game is played. In the case of the DYL toolkit, the playing board rather fulfils a role similar to that of a bulletin board. It acts as a hub to store past work and conclusions.

### Canvases

There are various canvases that the user will draw and write on. The purpose of these canvases is to allow the user to put much more information on paper compared to what they can do with the cards. In situations where more thorough input is required, canvases provide ample space and opportunity for the user to write or draw on in a guided fashion.

For example, one canvas in phase 1 (*‘My Situation’*) allows the user to write down and structurally track their daily routines (see figure 5). This canvas would then serve as valuable input for subsequent exercises in which the user then analyses this data. Another example is a canvas in phase 3 (*‘My Ideas’*) in which the user draws on ‘black boxes’ to create various mechanics (see figure 6). This is an exercise in encouraging creativity and expanding the mind, which would prove helpful in eventually thinking up potential solutions for their goal.

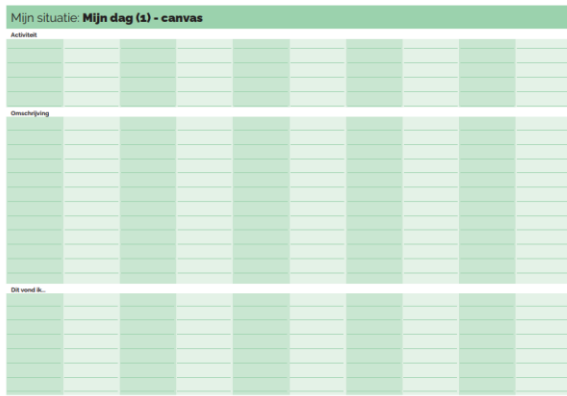


Figure 5: "My Day" Canvas (phase 1, My Situation) ('Design Your Life Toolkit Materialen', 2022)

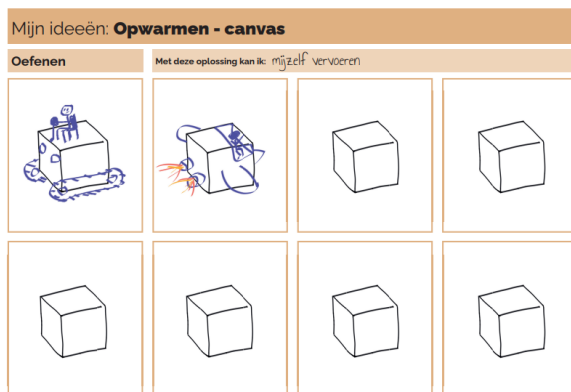


Figure 6: "Warming up" Canvas (phase 3, My Ideas) ('Design Your Life Toolkit Materialen', 2022)

## Other Tools

Lastly, there are a couple of minor extra elements included in the toolkit (see figure 7). These include pens, markers, sticky notes, stickers, etc. The purpose of these is to potentially help enrich the experience of using the other tools. For example, one of the sticker packs shows emojis expressing various emotions. The purpose of these is to help bring down potential barriers in expressing one's own emotions in a clear and understandable way, which is one of the key observations in YAWA (Chaidi & Drigas, 2020).



Figure 7: Miscellaneous items in the DYL Toolkit

### **3.1.1 To improve on the DYL Toolkit**

While the kit has a lot of content as well as a clear structure, there are a number of issues that can be derived from analysing the physical representation. I was able to take many notes while going through the toolkit, all of which can be found in appendix 1. Many of these are just minor nitpicks, but there were three larger overarching problems that stuck out.

#### **1. A lack of practicality**

A problem that immediately presents itself is the practicality of using the provided materials. Almost every tool in the toolkit requires the user to first find and organize certain materials provided in the box, be it a set of cards, a canvas, pen and paper, etc. Furthermore, many of the card sets need to be divided into certain subsets or organised in a particular way. This kind of organising may seem minor, but one must consider that the toolkit carries dozens of tools. As such, the organising very quickly becomes tedious work, and is one of the contributing factors to the toolkit having a noticeable entry barrier. This is especially relevant within the context of autism, seeing as YAWA have a weaker ‘central coherence’ in comparison to their neurotypical peers, making it more difficult to make sense of the overwhelming amount of input collectively (Fletcher-Watson & Happé, 2019). It feels like this kind of organizing should be present in the toolkit itself, where the user can easily find the necessary tool and start working with it. This should be an easy fix.

#### **2. A disconnect between materials**

The second apparent problem is the disconnect between the contents of the box. While presented as a complete toolkit, the user will find themselves continuously switching between using the bundle, the tools, and the board. It creates a disconnect between the elements, and it works against the concept of applying the conclusions and insights of past completed work to future tools and thinking. The user reads the bundle to see what tool to use next, then they use that tool, then they put the tool away and come back to the bundle. With the sheer amount of tools in the box, I found that halfway through the process, the first tools I used were already gone from my memory. There simply seems to be some kind of connection, a common thread that is missing.

#### **3. An underutilized playing board**

Lastly, there is the issue of the playing board. When first opening the toolkit, it feels as if the playing board is going to be the centre of the experience. It visualizes the entire process as well as containing satchels to store conclusions. It resembles playing boards from tabletop games, like Monopoly or Risk, and as such it first seemed to be the ‘core’ of the process. I quickly figured out however, that the playing board feels largely obsolete. Since the user is not physically playing a game on the board, it feels unnecessary to take it out of the box past the first session. That said, it does allow the user to store (what they have deemed to be) important playing cards in satchels, one for each of the six phases. In addition, the user is encouraged to write on these satchels as well. This idea makes theoretically makes sense, seeing as it establishes a track record and allows the user to connect to past thoughts and conclusions. In practice however, since the board truly has no function other

than to store progress, I found myself largely ignoring it. This is a shame, seeing as the idea of encouraging the user to consistently reflect back can be really worthwhile. The board is very large and unwieldy for its function, and the opaque satchels quite literally cover up any conclusions. While this was a conscious design choice to prevent information overload and help the user (specifically YAWA) move on to the next phase, the implementation also introduces an unnecessary barrier that prevents the user from quickly reflecting back on past work.

## **3.2 Literature Review: Autism**

To understand how to build a toolkit for YAWA, it is important to understand what autism entails. Autism Spectrum Disorder (ASD), more commonly referred to as simply autism, is clinically characterized by having difficulties with social communication and social interactions, in addition to displaying restricted and repetitive patterns in behaviours, interests, and activities (American Psychiatric Association, 2013). The way and degree to which ASD affects the individual varies, making it a heterogenous disorder (Georgiades et al., 2013). Essentially, everyone experiences ASD differently. This makes it difficult to address ASD related pain points on a general scale, seeing as they differ from person to person. According to Fletcher-Watson and Happé, three levels in the study of autism are particularly useful, those being the biological, the cognitive, and the behavioural. The distinction between these three is stressed (Fletcher-Watson & Happé, 2019). For this thesis, it makes sense to focus on autism from a cognitive perspective. This is because the goal of this part of the research is to find traits associated with YAWA that can be practically addressed through design choices. To do so, it is important to understand the cognition of YAWA, particularly cognitive traits distinct from neurotypical people, and how to work *with* those traits rather than seeing them as obstacles<sup>4</sup>. By designing with these distinctions in mind, one can design for autism.

### **3.2.1 Hypo- and Hypersensitivity**

Although not included in the diagnosis of autism, sensory symptoms in the form of hypo- and hypersensitivity are core to the autistic experience (Fletcher-Watson & Happé, 2019). Any of the senses can be prone to this hypo- or hypersensitivity. In addition, the same person can experience both at the same time, present in different symptoms. For example, they can be sensitive to physical touch, while at the same time being unbothered by loud noises. Hypo- and hypersensitivity can even occur in the same sense (Fletcher-Watson & Happé, 2019). For example, the person could be overstimulated by a loud group of people, but unbothered by loud construction noises. When designing a prototype, potential sensory overstimulation in people with hypersensitivity should be avoided. As such, designs should not be too 'loud'.

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<sup>4</sup> In this thesis, I will focus exclusively on traits that can be applicable to practical design. There are other traits that are more prevalent in YAWA, i.e., difficulty with social interaction (American Psychiatric Association, 2013), increased rates of anxiety, and most notably depression (Hollocks et al., 2019). These traits do not explicitly affect design choices to the degree that the other described traits do, so while I recognize that they could theoretically positively inform decision making during the design process, I will particularly focus on the more explicit traits that lead to concrete design choices.

Since the toolkit is a physical thing to be understood and interacted with, particular focus should be put on preventing visual and tactile overstimulation. One factor that should be taken into account is that the design should not be whittled down to the point of being mundane, or ‘too clean’. This risks understimulation, particularly in those with hypo-sensitivity. The design should not overstimulate the userbase, but it should still remain intriguing and engaging.

### **3.2.2 Visual Processing**

An notable trait found in YAWA is their proficiency in visual search tasks. When compared to neurotypical people, YAWA have been found to be better able to visually discriminate specific elements (O’Riordan et al., 2001; Samson et al., 2012). On the other hand, YAWA’s global visual processing has been found to be lacking in comparison to their neurotypical counterparts (Dakin & Frith, 2005). When designing for YAWA, addressing these two aspects can help the users better interact with the design. One can make use of YAWA’s superior visual discrimination by not being afraid to group multiple, distinct visual elements together in a design. As such, as long as visual elements are notably distinct from one another, tight grouping or presenting a large group of visual elements simultaneously does not negatively affect the users ability to distinguish and focus on one specific trait (Samson et al., 2012). That said, the designer should not present a larger group of visual elements with the expectation that the user can understand and make sense of the group as a whole, as this in turn is an aspect that YAWA can struggle with (Dakin & Frith, 2005). The key understanding is that the designer should not be afraid to present the user with numerous visual elements, but with the knowledge that they should have the user focus on only one element at a time.

### **3.2.3 A note on Neurodiversity**

More recently, there has been a movement within the autistic community to instead refer to autism as (a form of) neurodiversity. The rationale behind this is to reframe autism from a condition or disease to a human specificity, like sex or race. Neurodiverse people would simply perceive the world differently from neurotypicals, and thus would not require a cure or a ‘fix’. This shifts the conversation from looking for cures, medicine, or treatments to simply addressing the wants and needs of neurodiverse people in the world. Society can be seen as being built for the neurotypical person to succeed, so a neurodiverse person may find more challenges and hurdles when trying to keep up (Ortega, 2009). To put this into perspective, a parallel can be drawn between the current conversation on neurodiversity and past conversations on homosexuality. Homosexuality used to be generally seen as a ‘disease’ that needed to be ‘cured’, but in the modern (western) world, it is now simply seen as a trait that some people possess that can be accounted for without pressure to adhere to the norm (Coleman, 1982). There is a place in the modern world for queer people, leading queer people to no longer being forced to adapt to a world that is not built for them (to a degree, of course). This could apply to neurodiversity as well, where it can be viewed as something that society should accommodate for, rather than seek to cure. Instead of neurotypical people being forced to change and adapt to fit in, perhaps the world they live in can meet them halfway, too.

### 3.2.4 To apply Traits in Autism in Designing Prototypes

In conclusion, there are several traits exhibited by YAWA that can be taken into account during the design process. The aforementioned traits exhibit clear practical applicability. The design should make use of YAWA's enhanced visual processing, while steering clear of requiring global processing of multiple visual elements. It should not be too overstimulating as to avoid triggering hyper-sensitivity, but also not fall into the trap of becoming too boring or 'clean' in order to maintain engagement and interest.

### 3.3 Literature Review: Embodied Sensemaking

To define embodied sensemaking, I refer to the work of Hummels and van Dijk (Hummels & van Dijk, 2015). They consider 'embodiment' and 'skilful coping' to be unique characteristics of mankind. People have the unique ability to engage with the world, and in doing so, develop skills while acting within said world. People perceive the world not merely as it is, but as a thing that can be interacted with, and even changed according to their vision. To act upon and access this perception, people can physically interact with the world around them, a form of expression. *"To cope skilfully in the world from day to day, we do not need a mental representation of the world itself; our body is simply solicited by the situation to find the right balance so as to gain a maximum grip on the situation."* (Hummels & van Dijk, 2015). Our body has the ability to process and act *with* the world, even if our brain may not (yet) comprehend it. We make sense of the world around us not merely by processing the stimuli that our senses send to our brain. Combining these two aspects of sensemaking together, along with the world around us, we arrive at a more familiar term; cognition (see figure 8) (Dijk et al., 2014).

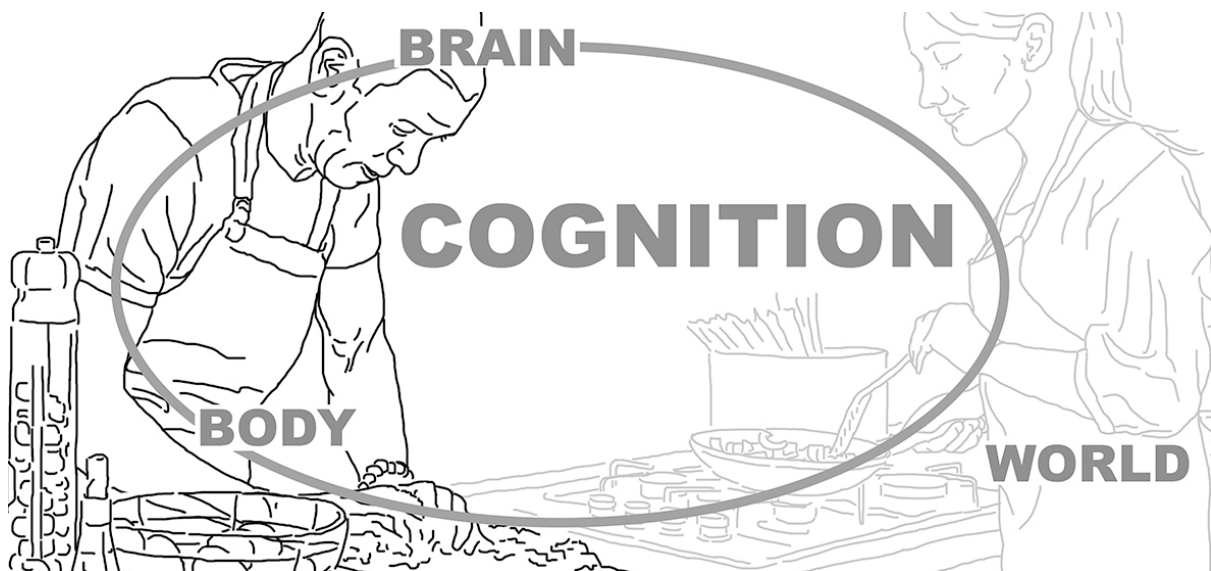


Figure 8: A visualisation of the concept of cognition (Hummels & van Dijk, 2015)

To relate this to the DYL toolkit, we first look at its current iteration. A lot of effort has been spent on relating the brain to the contents of the toolkit. After all, as mentioned in 1.4, a lot of research and effort has been spent on making sure that the theoretical content of the toolkit is sound. That said, the physical form of the toolkit

has not received the same amount of attention and consideration. We can draw a parallel between this disconnect and the concept of cognition. The connection between the brain and the ‘world’ (in this case the toolkit) has been firmly established. However, while there has been effort put into including the body in this relationship, there is still much more potential to be explored. For example, closing off the satchels on the playing board was a conscious design choice to prevent information overload and help the user move on to the next step. However, this is only one step, and the way and degree to which this goal is achieved can still be explored in different ways. To allow the user to experience more meaningful cognition in relation to the toolkit, incorporating the body into the connection with the brain and the world can be taken as a starting point. To do so, drawing from theories on embodied sensemaking makes sense. The goal is to improve the way in which the user makes sense of the toolkit, specifically in an *embodied* fashion.

### 3.3.1 Applying Embodied Sensemaking using a Framework

To apply these theories in a practical way, van Dijk proposes a framework of three roles that a ‘thing’ can inhabit to go beyond familiar functions of those things (see figure 9) (Van Dijk, 2023). The familiar functions of a thing in this case are those of storage and representation, like a whiteboard, an agenda, or indeed; the current toolkit. These three roles are as follows:

- *Role 1: Things play a productive role in the formation and sustainment of sensorimotor couplings, or in other words: things figure in our skilful ways of dealing with the world.*
- *Role 2: Things function as attunement anchors in participatory sensemaking, a self-organizing process taking place between people.*
- *Role 3. Things become part of the lifeworld, which provides a necessary contextualizing background to all sensemaking.*” (Van Dijk, 2023)

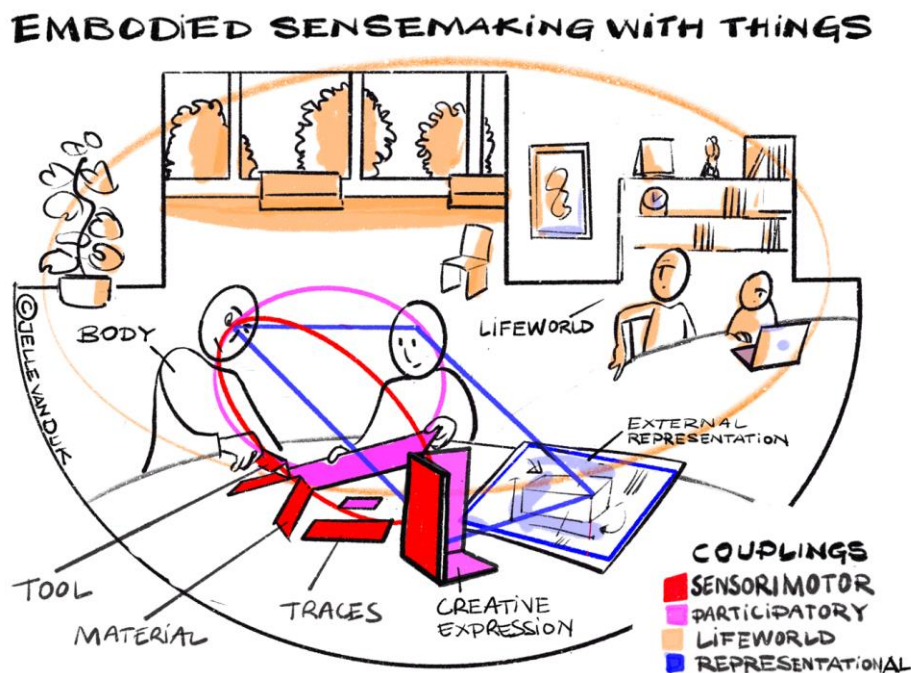


Figure 9: Embodied sensemaking in the context of PD. (Van Dijk, 2023)



I propose that by applying these roles to the development of a new toolkit, we can achieve a toolkit that goes beyond its current role of storage and representation. It would improve the way in which the user can make sense with the toolkit in an embodied fashion. In turn, by improving that part of sensemaking, the cognition between the toolkit and the user may improve. All this with the goal of improving the way in which the user experiences and understands the content of DYL.

### **3.3.2 The Framework Explained**

#### *Role 1: Sensorimotor Couplings*

The first role that a ‘thing’ can play in sensemaking is that of an extension of ourselves. We commonly refer to these as tools (not to be confused with the tools in the DYL Toolkit!). For example, a carpenter’s hammer can be considered a tool in this context. The access to a hammer fundamentally changes the carpenter’s relation between his body and his world (which in this context could be a wood workshop, for example). This is a sensorimotor coupling; the phenomenon in which a ‘thing’ becomes an extension of the body, and in turn, loses its identity as a ‘thing’. The carpenter is responsible for making a piece of furniture, not the hammer. Yet in a way, the hammer did the hard work. When augmenting our body with tools, we can interact with the world around us in a different way (Van Dijk, 2023). Just like the carpenter has an easier time achieving his goals through using the hammer as a tool, a sensorimotor coupling, the user of the DYL toolkit could make use of sensorimotor couplings to enhance their experience as well.

#### *Role 2: Things in participatory sensemaking*

Another role that a ‘thing’ can play is that of an enabler of shared sensemaking. When two people work in tandem on the same project (for example, the user and the co-designer working together on the DYL project), an ever-changing connection forms between the two people. If one increases the amount of people involved, the number of connections multiply further. Other people are a part of our world, so we as humans are also ever trying to make sense of the people around us. On top of that, those very people are also trying to make sense of *us* at the same time. Van Dijk refers to this as attunement; we are constantly trying to adjust our external representation (i.e. posing, tone of voice, eye contact) to find a ‘common ground’ with the people around us, a place in which we can understand and make ourselves understood. By introducing a ‘thing’ in this relationship, we allow people make sense of each other *through* that thing. For example, with two people working together on a prototype, one can observe the way the other is working on the prototype, and make assumptions on how the other person understands the plan. Essentially, it gives people an additional point of view in which they can make sense of another person, potentially resulting in an easier and stronger sense of attunement between the participants (Van Dijk, 2023).

#### *Role 3: Things that make up the lifeworld*

Lastly, a role that a ‘thing’ can play is that of the lifeworld, or a part of the lifeworld. Lifeworld refers to everything implicit that surrounds the explicit. The backdrop, the décor of our experience. If we take the carpenter example from before, his workshop (and everything in it) can be considered his lifeworld. The lifeworld is not static. In

fact, we as people directly influence our lifeworld. When we finish tasks or projects, and they leave behind some kind of artefact, it becomes a part of our lifeworld. The explicit becomes the implicit. The lifeworld acts as our frame of reference, and can directly influence our thinking. Without a lifeworld, life would not make sense. All of our sensemaking is relative, and it is relative to our implicit surroundings (Van Dijk, 2023). In the context of the toolkit, we know that the user is usually working with one tool at a time. As such, the rest of the toolkit becomes part of the lifeworld, and has an influence on our experience. Currently, a way that this is applied is in the form of the playing board. Yet, a limitation of the playing board is that it is primarily 'made' by the user, its primary informing factor is the collection of conclusion that the user has made in the past. The only pre-existing value that it contains is the visualization of the DYL cycle. Adding more value to the users lifeworld could prove fruitful in guiding the user towards creative thinking, or helping the user get started. Something to note here is that the example of the DYL playing board merely mentions the content of the board. The physical way in which that content is communicated is still open to exploration and improvement. After all, the focus lies on the user making sense with the assistive technology in an *embodied* fashion. The DYL toolkit does have another, more concrete way of making use of the users lifeworld. Two tools in particular stand out, those being '*Mijn Situatie: Mijn Ervaringen*' (My Situation: My Experiences)" and '*Mijn Test: Gebruikerstest*' (My Test: User testing)". The user is provided with three cardholders along with cards to put around their living area or the location at which they are going to test their tool. The purpose of these tools is to add reminders into the users lifeworld. Adding these elements to their lifeworld can help remind the user to think and reflect on the respective tools when they are not actively using the toolkit.

### **3.3.3 To apply the Framework in Designing Prototypes**

In conclusion, the design of a toolkit that fulfils the aforementioned three roles can help push the toolkit past merely an object of representation, and towards contributing to creative and conceptual thinking. By addressing and attempting to improve the way in which the user makes sense of the artefact, the philosophy and theory in which DYL is rooted can be understood on a deeper, more meaningful level. However, there is one practical issue that emerges when trying to apply the three roles in this context. As mentioned in 1.4, while the DYL toolkit is designed for and meant to be used by a YAWA along with a co-designer (i.e. a parent, caretaker, or nurse), the co-designer is excluded from this thesis. Since role 2, "Things in participatory sensemaking", centres on the connection between the user and potential co-designers, I will not be incorporating it in the final design. I do believe that there is value to be found in reflecting on the toolkit from the perspective of role 2, perhaps leading to new insights and design changes for the better, which is further explored in chapter 6.

## 4 Method

My approach to this research will be that of a ‘research-through-design’ (hereafter RtD) structure . RtD is an approach to research in which the researcher participates in both the design and the research process simultaneously (Koskinen et al., 2011). Both the design and the research process inform each other, creating a cycle in which each of the processes can build upon conclusions of the other. In addition, the design aspect of creation is cast as research in and of itself (Godin & Zahedi, 2014). By thoroughly documenting the design process, the designer can reflect on the design and make decisions informed by this reflection *during* the process (Stappers & Giaccardi, 2017). I visualized this process in figure 10. This approach seems very fitting for this research, seeing as my task is to work on and improve upon a currently existing design artefact; the DYL toolkit. From start to finish, I will be able to use the toolkit (and future iterations) as concrete artefacts that center my research. This approach has been used in past, similar projects for the same reasons (Van Dijk, 2023; Zimmerman et al., 2007).

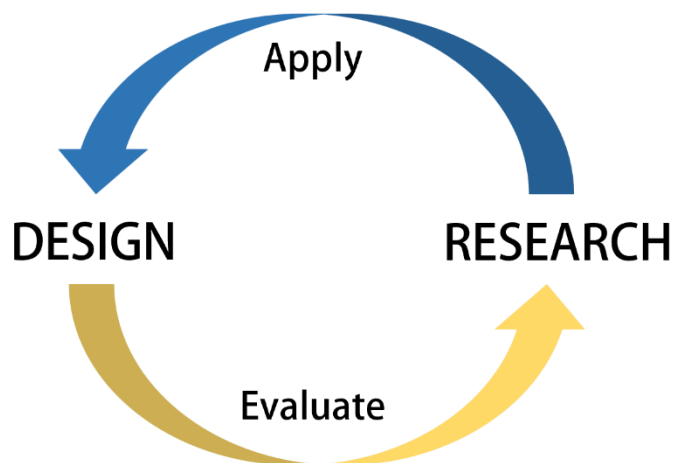


Figure 10: A visualisation of the cyclical nature of RtD

Because RtD is cyclical in nature (Zimmerman et al., 2010), one needs to make concrete decisions as when to a prototype is ‘finished’ (Koskinen et al., 2011). After all, where does one draw the line? As long as the design keeps on changing and growing, it does not have any true ‘stages’, instead it can be perceived as an amorphous, ever-changing thing. To structure and shape this research however, I want the design to very much exist in a number of iterations. Not only should this help in categorizing feedback to correspond with those stages, it may also help me in being able to structurally reflect back on my decision-making both during and post research. In addition, to be able to reflect meaningfully on these iterations from a physical perspective, I will make a prototype to accompany each of the iterations as deliverables. After all, since this research focuses on physical form-giving through the lens of embodied sensemaking, having a physical prototype to see, hold, and use can prove to be a valuable asset during evaluation, as well as being another part of my research. As such, my process will cycle between research, design, and prototyping (see figure 11).

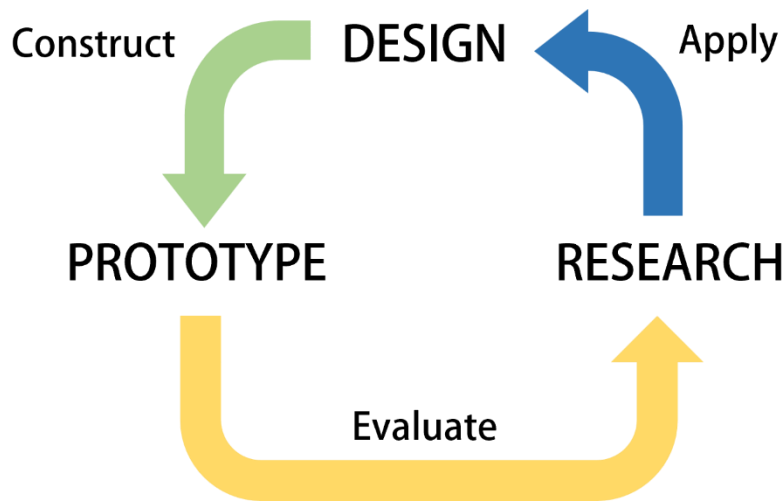


Figure 11: A visualisation of the RtD cycle in this research

I choose to divide this research into three cycles, each centred on one of three iterations, and each with a physical prototype as a deliverable. Every prototype is grounded in input and/or feedback from a relevant source. I briefly introduce the structure and purpose for each of the prototypes.

#### 4.1 Cycle 1

The purpose of prototype 1 is to get the design process started, to smooth out some of the more apparent design flaws in the current toolkit, and to start the feedback loop into the research (see figure 12). It should result in a starting point that can act as a jumping pad to help shape the second prototype. Because of these reasons, prototype 1 will be lo-fi. Its purpose can be fulfilled without needing the rougher edges to be polished up, especially when that time is better spent on later prototypes. The foundation on which the design is built is the analysis of the DYL toolkit. There were three major problems found during that analysis (see 3.1.1), namely the lack of practicality, a disconnect between materials, and an underutilized playing board. As such, the requirements are as follows:

<b>Requirements Cycle 1</b>
<i>1. Increase practicality in using the toolkit to lower the entry barrier in using the toolkit</i>
<i>2. Connect existing materials together, to create an intuitive flow as the user moves through the design process</i>
<i>3. Redesign the playing board to make it more accessible and functional</i>

The prototype is to be reviewed by myself and my supervisors. This is because it allows me to quickly gather valuable feedback, and move on to the next stage. After all, it is only the first, lo-fi prototype, and as such does not require very thorough reviewing and testing. This is reserved for later prototypes, which will likely skew much more in the direction of what the final product will actually look like. Prototype 1 will be judged on the degree to which it fulfils its three requirements. Well-received design choices are to be maintained in future prototypes, whereas unsuccessful changes are to be redesigned and/or discarded.

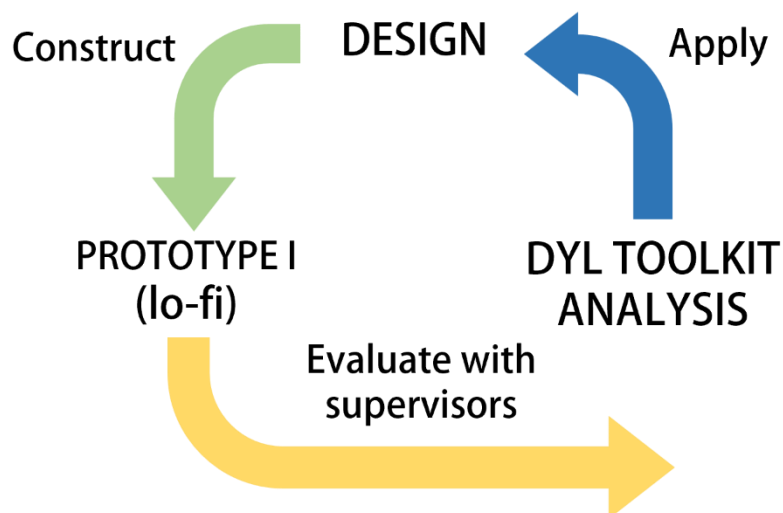


Figure 12: A visualisation of cycle 1

## 4.2 Cycle 2

The purpose of prototype 2 is to be a rough version of what the final iteration should look like. As such, at this stage, the results from prototype 1 will be combined with findings on how to practically apply background theory. Prototype 2 is built upon three main foundations. First, it should include feedback on prototype 1, maintaining its successful aspects while addressing points of improvement. Second, it should incorporate the conclusions on research on autism, becoming a design is made to play into YAWA’s strength in visual processing of specific elements. The user should only be required to focus on one thing at a time, and avoid global processing, as mentioned in 3.2 (Dakin & Frith, 2005). The design should also not be too ‘loud’, as to avoid triggering hypersensitivity, but also not fall into the trap of being too ‘clean’, as to avoid disengagement. Lastly, it should incorporate the framework of embodied sensemaking mentioned in 3.4, specifically role 1 (Sensorimotor Couplings) and 3 (Lifeworld), in order to push the toolkits function past simply representation. As such, whereas prototype 1 focuses on resolving current issues, prototype 2 has the potential to bring something new to the toolkit, to give it additional value. Feedback on these quandaries can be garnered without having to present a fully detailed prototype, so a lo-fi prototype should suffice. To summarize, the requirements for prototype 2 are as follows:

<b>Requirements Cycle 2</b>
<i>1. Incorporate well-received changes from iteration 1, while addressing feedback.</i>
<i>2. The user should focus on 1 element at a time, and avoid having to make global overviews</i>
<i>3. The design should not be too ‘loud’ and overwhelming, while also not being too ‘clean’ and unengaging.</i>
<i>4. Design the prototype with role 1 in mind; To allow (part of) the toolkit to play the role of a thing as an extension of ourselves.</i>
<i>5. Design the prototype with role 3 in mind; To make use of the toolkits role as the lifeworld, the backdrop, to implicitly support the design process.</i>

Prototype 2 is to be reviewed by experts in this field of research. In this case, that refers to the team that works on the DYL project, or has worked on it in the past. By presenting the prototype and its motivations to a council of experts in embodied sensemaking, autism, and of course the DYL project itself, I expect to be able to garner valuable feedback. This feedback then becomes the starting foundation for the formation of prototype 3. Similar to the first prototype, well-received implementations of the core design input are to be maintained through prototype 3, whereas otherwise lacking design choices are to be reconsidered.

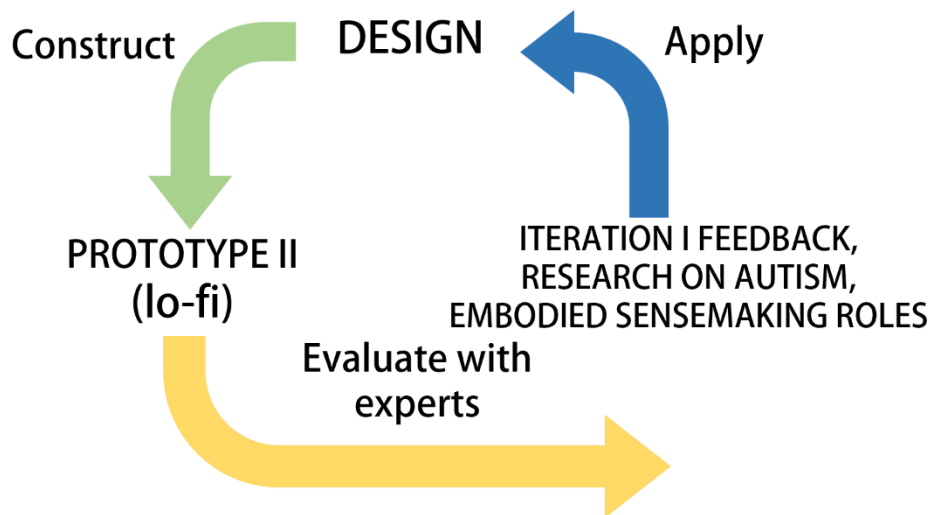


Figure 13: A visualisation of cycle 2

### 4.3 Cycle 3

Finally, prototype 3 is the stage in which the toolkit should be close to its final form, being built on a foundation of expert feedback and opinions as well as thorough research on the topic of embodied sensemaking in the context of autism. Its purpose is to be evaluated by the userbase (people with autism) in order to garner feedback on whether the physical form of the toolkit can truly help stimulate creative sensemaking when working with it. The evaluators will be asked to justify their reasoning as to why they think certain design changes achieve their goals, whereas other might not. Prototype 3 is largely based on prototype 2, with minor design changes based on the expert evaluation. Yet, whereas prototype 2 was lo-fi, prototype 3 is to be hi-fi, to the point where it can be properly used and tested. With this in mind, the final toolkit takes shape. The requirements of prototype 3 are as follows:

<b>Requirements Cycle 3</b>
<i>1. Incorporate well-received changes from iteration 1 and 2, while addressing feedback.</i>
<i>2. Have the ability to fulfil both role 1 and role 3 from the embodied sensemaking framework, with emphasis on role 3.</i>
<i>3. Include existing theoretical content, such as the tools, to the point where the prototype can actually be used.</i>

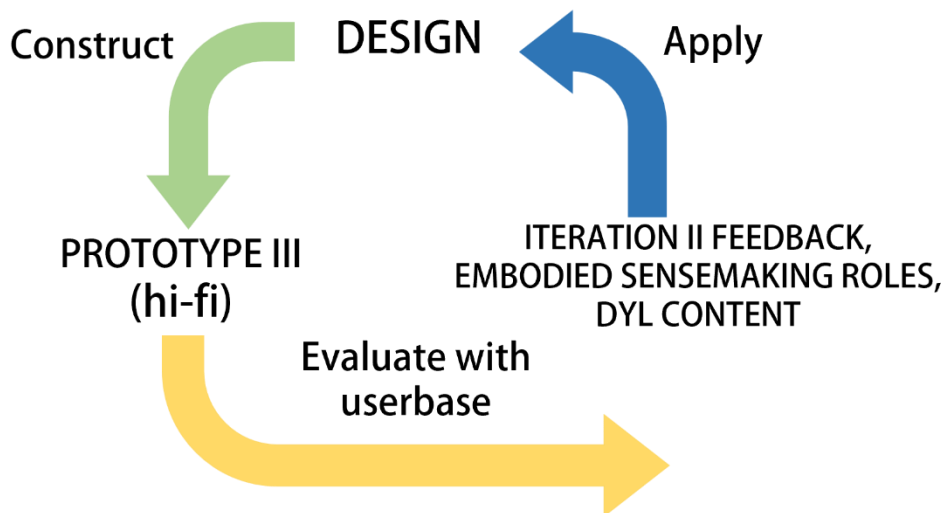


Figure 14: A visualisation of cycle 3

#### 4.4 Overall Requirements

To conclude, the three prototyping cycles should adhere to the following requirements.

Cycle	Requirements
1	1. Increase practicality in using the toolkit to lower the entry barrier in using the toolkit
1	2. Connect existing materials together, to create an intuitive flow as the user moves through the design process
1	3. Redesign the playing board to make it more accessible and functional
2	1. Incorporate well-received changes from iteration 1, while addressing feedback.
2	2. The user should focus on 1 element at a time, and avoid having to make global overviews
2	3. The design should not be too 'loud' and overwhelming, while also not being too 'clean' and unengaging.
2	4. Design the prototype with role 1 in mind; To allow (part of) the toolkit to play the role of a thing as an extension of ourselves.
2	5. Design the prototype with role 3 in mind; To make use of the toolkits role as the lifeworld, the backdrop, to implicitly support the design process.
3	1. Incorporate well-received changes from iteration 1 and 2, while addressing feedback.
3	2. Have the ability to fulfil both role 1 and role 3 from the embodied sensemaking framework, with emphasis on role 3.
3	3. Include existing theoretical content, such as the tools, to the point where the prototype can actually be used.

# 5 Iterative Cycles

## 5.1 Cycle 1

In this first cycle, the first lo-fi iteration is built on the foundation of the analysis of the DYL toolkit and its current issues, explored in 3.1. The goal of the iteration is to address the main three surface-level problems while maintaining or even amplifying existing pros.

### 5.1.1 Requirements for the first iteration

In 3.1.1, I outlined the three major problems that present themselves when using the current version of the toolkit, which were then translated into three requirements in 4.1. As a reminder, these were:

Requirements Cycle 1
1. Increase practicality in using the toolkit to lower the entry barrier in using the toolkit
2. Connect existing materials together, to create an intuitive flow as the user moves through the design process
3. Redesign the playing board to make it more accessible and functional

As a starting point for iteration 1, it seems only logical to address these issues first. By eliminating these obvious, surface-level issues, the next iteration can serve to uproot underlying problems that might currently be difficult to identify. In addition, addressing the three main surface level issues with the current toolkit allows me to quickly and practically make the first iteration and engage with the ‘design’ aspect of RtD.

### 5.1.2 Prototype 1

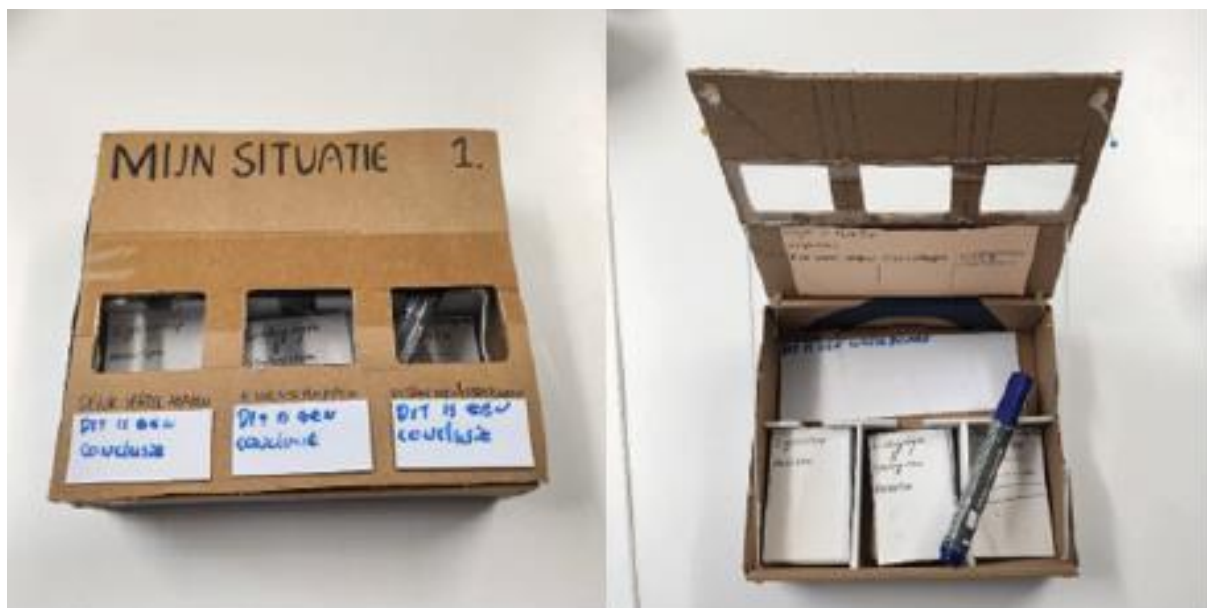


Figure 15: Prototype 1



## Prototype 1

This prototype is a first attempt at addressing some of the obvious pain points of the current design of the toolkit, and is intended as a starting point to iterate on further down the line. Each of the three requirements are the result of practical pain points. These pain points are laid out as practical problems that can be addressed concretely. By resolving these practical problems, the corresponding requirements should be met.

**Requirement 1:** Increase practicality in using the toolkit to lower the entry barrier in using the toolkit.

**Pain Point 1:** The toolkit consists of many pieces, and each method starts off with the user having to gather the right tools, including having to sort through many stacks of cards that all look alike. Instead of getting to start off on the right foot, it quickly becomes a loathsome chore because of its repetitiveness.

**Solution:** The toolkit is split up in 6 boxes, one for each of the 6 steps. The box contains all necessary tools and elements to complete the methods association with that step. For example, the box for step 1 *'My Situation'* contains the method cards, a small whiteboard and a marker. Each of the tools are assembled in an orderly fashion, making the toolkit more intuitive to use. In addition, not having to look for the right card set in a sea of other card sets may help reduce the perceived (potentially overwhelming) scope of the toolkit. In other words, one tool at a time!

**Requirement 2:** Connect existing materials together, to create an intuitive flow as the user moves through the design process.

**Pain point 2:** In the current situation, the user needs to constantly switch between the bundle and the tools. The bundle is essentially the written step-by-step plan on how to navigate from each of the tools. It contains all necessary information, including a lot of options or tools that the user might not even need or want to use. This leads to the bundle becoming quite intimidating to work through because of its sheer size and range of options.

**Solution:** The instructions are included on the inner side of the lid. These instructions would not only include how to approach each of the methods, but also why the user might want to work with this method. If the user chooses not to do so, it cuts down on a lot of unnecessary information.

**Requirement 3:** Redesign the playing board to make it more accessible and functional.

**Pain Point 3:** After completing or finishing most of the current tools/methods, the chosen artifacts (i.e. specific cards) are hidden in a satchel on top of the

playing board. These artifacts are meant to help the users immediately remind themselves of what the big takeaways were from that specific method. However, the cards cannot be seen at a quick glance due to the satchels being opaque, and the conclusions are stuck on a large unwieldy playing board.

**Solution:** Before participating in a specific method, the user can see the back of the cards through the lid of the box. After completing this method, the user can lay the most relevant card on top of the stack, both as an indication that they have completed that step, but also to immediately show them the result of that method. In addition, whereas the current conclusions are all written on the satchel on the board, in this iteration, the conclusions are all written underneath each specific method. This introduces structure and automatically orders the conclusions in a logical sequence. The room to write the conclusion is intentionally kept small as to encourage the user to write down their findings in a concise manner, or even in the form of keywords.

### 5.1.3 Reflection

In conclusion, the prototype addresses the main three problems found during the analysis of the DYL toolkit. However, it does not yet consciously address the toolkit from the viewpoint of autism and embodied sensemaking. These two aspects are to be introduced in prototype 2. That said, one can reflect on the presence of these two aspects that might already be there.

In regards to designing for autism, one of the main takeaways was that the design should not require the user to perform large global overview, instead allowing the user to remain focused on a single aspect at a time. The original toolkit did try to account for this by using the opaque satchels to store conclusions for each of the six phases. The intent was to give the user access to past work and conclusions, while covering that up until the user consciously wanted to look at them, in order to represent the phase in question as ‘finished’. However, in the end, it still requires the user to perform a global overview when working with the playing board. In addition, while the bundle was logically structured and organized, it again reinforces global processing, rather than working with a single element at a time. By splitting the kit into 6 pieces and getting rid of the bundle, this need for global processing is suddenly taken away. What’s more is that it allows for room to display past conclusions in greater detail without covering them up. Instead of covering up their work, when the user is finished, they simply close the box and move on to the next one. The user is no longer required to handle, face, or process past tools. A side effect of storing all tools in one box (like the current toolkit) is that the user is continuously confronted with past work, as well as uncompleted future work. Taking those two away allows the user to focus merely on the present.

While not consciously designed with embodied sensemaking in mind, the prototype makes a start in regards to adhering to the roles of van Dijk’s framework. Role 1, Sensorimotor Couplings, stands out in particular. The way in which the user interacts with the toolkit is fundamentally changed. Prior, the user would mostly interact with the bundle and the tools, occasionally using the playing board at the end of each phase. While the interaction with the tools is unchanged, the bundle and board are now replaced by the kit itself. When using the current toolkit, the user never truly has

the full product in their hands. They are always tied to the storage box, which contains the tools that they will use in the future. They do not even know which tools those might be until the bundle tells them to grab and use them<sup>5</sup>. The prototype is different in that it is completely self-contained. When the user has the kit in their hands, they know that everything they might ever need is contained within that kit. This of course is still not comparable to physical tools like the carpenter and their hammer described in 3.3.2, but it is a noteworthy difference.

## 5.2 Cycle 2

In this second cycle, the lo-fi iteration is built on the foundation of feedback on prototype 1, as well as applying design guidelines in relation to autism and embodied sensemaking. The main goal of prototype 2 is to move past the idea of using the toolkit as a storage box. Instead of (exclusively) fixing current issues, I want to start adding value to the toolkit. To do so, I make design choices informed by theories on autism and embodied interaction.

### 5.2.1 Requirements for the second iteration

The second iteration is built on the base of the first iteration. In 3.2 and 3.3, I outlined ways in which a designer can incorporate knowledge on autism as well as a framework of embodied interaction into their design. These were then translated into requirements in 4.2. As a reminder, these were:

<b>Requirements Cycle 2</b>
<i>1. Incorporate well-received changes from iteration 1, while addressing feedback.</i>
<i>2. The user should focus on 1 element at a time, and avoid having to make global overviews</i>
<i>3. The design should not be too 'loud' and overwhelming, while also not being too 'clean' and unengaging.</i>
<i>4. Design the prototype with role 1 in mind; To allow (part of) the toolkit to play the role of a thing as an extension of ourselves.</i>
<i>5. Design the prototype with role 3 in mind; To make use of the toolkits role as the lifeworld, the backdrop, to implicitly support the design process.</i>

### 5.2.2 Feedback on iteration 1

Through evaluating prototype 1 with two supervisors who are both currently working on the DYL project as well, we were able to discuss and reflect on the grander scale issues that remain. This analysis is thoroughly written out in an essay, found in appendix 2. In short, the prototype fulfilled its function in eliminating surface-level problems, so with this in mind, we kept coming back to the major overarching problem; the scale. The DYL toolkit is a large project with many components. As such, the user will most likely be working with the toolkit for weeks on end.

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<sup>5</sup> Technically, the bundle does inform the user on each of the tools that they will be using at the starting overview. However, one can question as to whether the user will remember this because of the sheer number of tools, as well as the aforementioned information overload that the bundle contains at the start.

One issue that the large scale brings with it is the entry barrier. With projects this big, a factor that needs to be taken into consideration is that it has the potential to come across as overwhelming. In its current form, the user receives the bare minimum in terms of introduction and guidance. This comes in the form of a quick explanation at the beginning of the bundle. From there on out, the user is expected to simply follow the upcoming steps in the bundle. From my own experience in using the toolkit from start to finish, at no point is the user informed on how much work they are expected to do in each phase. When I first started on the project, I expected each of the six phases to be roughly similar in terms of scope. This is not the case, with phase 1 being by far the largest, and phase 2 by far the smallest. This creates false expectations for the user. When I finished phase 1 myself, I dreaded having to go through five more phases of a similar scope. All of this can be avoided by clearly and concisely setting proper expectations for the user.

In response to the overwhelming scope of the toolbox, the DYL team and myself decided upon a solution. The toolbox is to be split into two parts; a physical component and a digital component. The physical component would be the base, a smaller toolkit that had a fraction of its former tools. However, it would be much faster and easier to get through. Essentially, it would be the smallest possible version of the DYL toolkit, while still fulfilling its role and duties. Depending on the users wants or needs, they can choose to expand upon the base toolkit with a digital component. This digital component would give the user access to the other tools that are no longer present in the physical component. This thesis specifically focuses on the physical component, although the physical toolkit should enable easy access and forwarding to the digital component, for should the user want to use those tools.

The six phases of the toolkit were also a topic of discussion. A trend that we noticed, is that when the phases are followed in order from 1 to 6, the user will find themselves constantly diverging and converging (see figure 16). Phase 1 (*My Situation*), 3 (*My Ideas*), and 5 (*My Test*) are the diverging phases, in which the user is encouraged to think and iterate freely. The goal is to garner a broad set of information; i.e. the users' habits in phase 1, or a broad selection of ideas in phase 3. On the opposite side, phase 2 (*My Focus*), 4 (*My Ideas*), and 6 (*My Lesson*) are converging phases.

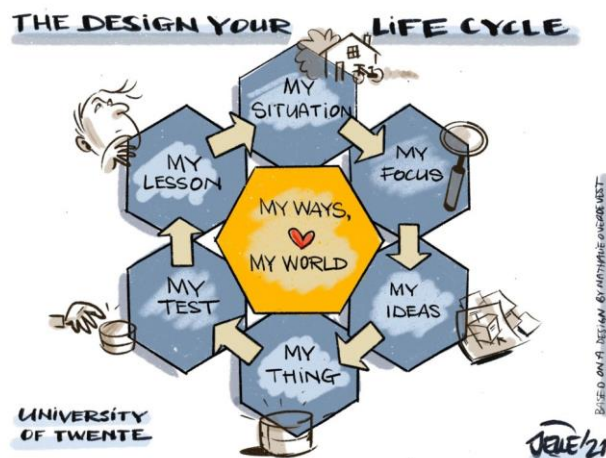


Figure 16: The Design your Life cycle, van Dijk (*About Design Your Life*, 2019)

The new design would go from six phases down to three. Phase 1 and 2 would merge, as would 3 and 4, as well as 5 and 6 respectively. This is a result of these respective phases being diverging and converging stages of the same process. For example, for a designer to narrow down their focus, they first have to explore their situation. Or, for a designer to come up with their preferred design, they would first need to explore a variety of ideas. The DYL cycle would still be present in the toolkit, but there is more emphasis on separating the three stages of divergence/convergence. See figure 17. This also leads to a design that focuses on three stages. In addition, I take the opportunity to include a 'central hub' in the design. Seeing as the process is cyclical, there is no true starting point, or a 'home base' that the user gets back to when they want a broader overview of the entire process, instead of focusing on one stage. This is already present in the DYL design philosophy (see figure 16; My Ways, My World), so it would only make sense to incorporate this into the design.

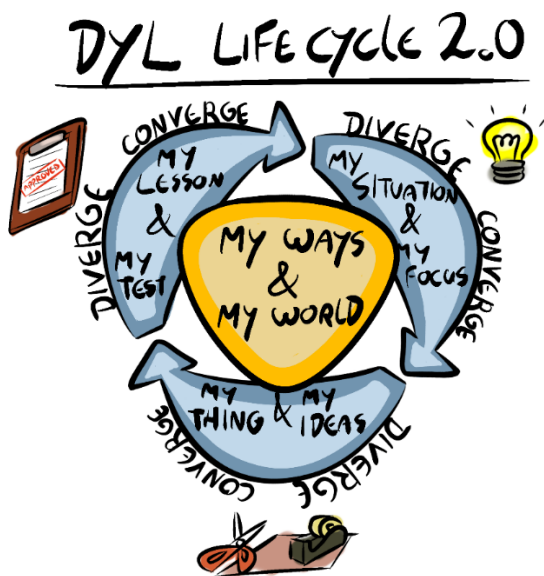
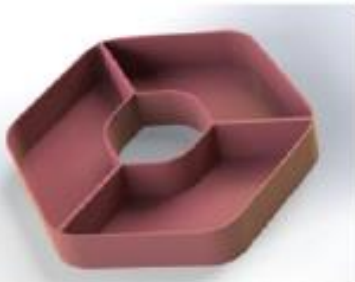
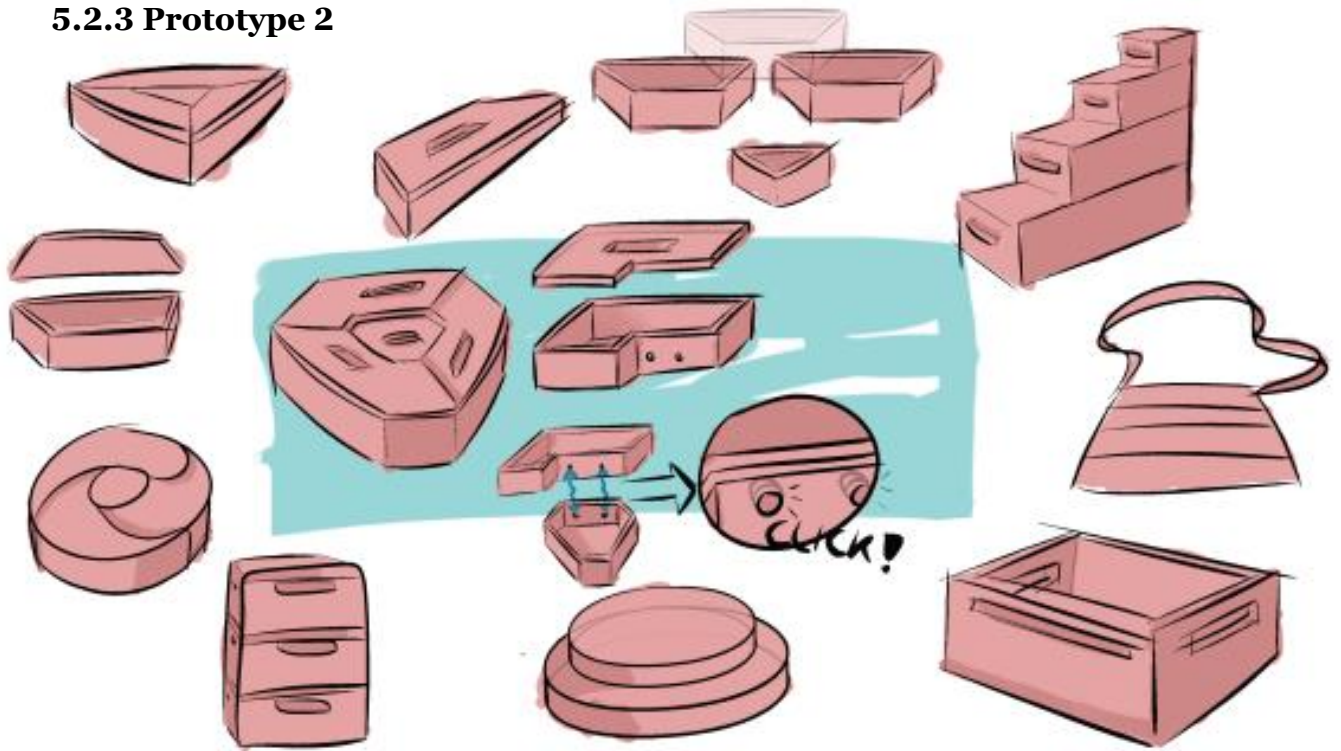


Figure 17: The DYL Life cycle 2.0

### 5.2.3 Prototype 2



## Prototype 2

This prototype is an attempt to bring new value to the toolkit rather than merely fixing current problems, which is achieved through informing design choices by research on autism and embodied interaction. Again, each of the five requirements are the result of practical pain points. These pain points are laid out as practical problems that can be addressed concretely. By resolving these practical problems, the corresponding requirements should be met.

**Requirement 1:** Incorporate well-received changes from iteration 1, while addressing feedback.

**Pain Point 1:** The current DYL system consists of 6 stages, and the toolkit is overwhelmingly big. To address these issues, the DYL cycle is simplified to 3 stages, with each stage containing a single (physical) method. The other methods can be accessed digitally. This is not (yet) reflected in iteration 1.

**Solution:** Maintaining the idea from iteration 1 that each phase has its own little toolkit, prototype 2 now consists of 3 kits, along with a center box. One of the main themes that myself and the DYL team have discussed throughout the process is the concept of circularity. This is referenced in the shape of the boxes, where each box is essentially an 'arrow' that points to the next phase. The triangle in the middle is the central box, which is intended to provide a starting point as well as a reflective stage that the user can come back to repeatedly. This is purposefully not included in the circular process, seeing as users can always choose to or not to reflect. It should be seen as a step back, an opportunity for the user to view themselves and the process itself, rather than a part of the process. The kits also support a connection to the digital component, where a phone can be used to access additional methods.

**Requirement 2:** The user should focus on one element at a time, and avoid having to make global overviews.

**Pain Point 2:** The current toolkit is unclear in communicating its scale and requires the user to jump from method to method, without giving a clear global overview. It does not take into account that YAWA typically struggle with global observation.

**Solution:** Splitting the toolkit up into four clear elements helps reduce the scope. In addition, the user only needs to open the kit of the method that they currently work with, which helps in preventing an overwhelming global scale. On top of that, each of the phases (and their corresponding kits) contain only one method. When the user is finished with one of the kits, they can come to the correct conclusion that they are one-thirds of the way in terms of process. This is in direct opposition to the current toolkit, where the scale of each of the methods vary wildly, potentially leading users to draw wrong conclusions on the amount of time and effort each phase is going to take.

**Requirement 3:** The design should not be too 'loud' and overwhelming, while also not being too 'clean' and unengaging.

**Pain point 3:** The current toolkit is (subjectively) not a visually stimulating or intriguing design. Especially from the outside, it is merely a 'box'.

**Solution:** The toolkit is now more than just a 'box'. It incorporates the theme of cyclicity in its design while also physically communicating with the user that the process consists of three different phases. That said, finalised design choices are also very dependent on the content itself, so stylization will have to be further explored in the third iteration. Something to note is that another takeaway from 3.2 (Designing for Autism) was that the design should not be too 'loud' and overwhelming. The current toolkit is already designed with this aspect in mind, so I did try not to add too much more visual flair. An aspect that will be included in the next iteration is the existing style, i.e. colour choices and fonts, since these were consciously chosen in order to not to overstimulate.

**Requirement 4:** Design the prototype with role 1 in mind; To allow (part of) the toolkit to play the role of a thing as an extension of ourselves.

**Pain Point 4:** The current toolkit merely fulfils the role of that of a representation of the design process. It contains tools in the form of methods, but its physicality does not feel like a toolkit.

**Solution:** The framework analysed in 3.3 denotes that a toolkit can go beyond mere representation by fulfilling other roles as well. Role 1 of the framework discusses using the toolkit as a tool itself, an extension of the body, and something that can help the user 'make sense'. In prototype 1, the bundle was fused together with the kit, making it so that the user physically interacts with the kit itself to understand it. This design choice is maintained, as it addresses role 1 of the framework. To fulfil that role even more, the lid of the toolkit contains a section where the user can place their phone to connect to the digital aspect of the kit. This choice was made not only to form a 'link' between the physical and digital component, but also to further reinforce the idea that the kit is the tool. While it does not achieve a sensorimotor coupling with the user in the way that a pen or a marker might, it does more than the current toolkit. As a sidenote, it does also maintain smaller physical tools that were included in the current toolkit, like those pens and markers.

**Requirement 5:** Design the prototype with role 3 in mind; To make use of the toolkits role as the lifeworld, the backdrop, to implicitly support the design process.

**Pain Point 5:** The current toolkit merely fulfils the role of that of a representation of the design process. It does not take into account that everything of the toolkit that is not in use becomes part of the users lifeworld.



**Solution:** Rule 3 of the framework is applied by taking into consideration that the toolkit itself is the lifeworld. Going back to the obvious pains addressed in prototype 1, we see that the lifeworld can also negatively affect the user. In this case, bombarding the user with information can be overwhelming and paralyzing. By taking away a lot of the lifeworld, we can focus on making sure that the remaining lifeworld can actually enhance the experience. What this looks like in practice is taking away a lot of background noise, such as a cardboard box full of card sets, canvases, boxes etc. The user chooses what they uncover, and the tools are presented to the user in portions. The quandary then becomes; how does one fill in the remaining lifeworld (the 4 boxes) with elements that implicitly add to a positive experience; perhaps creative thinking, a clear mind, clear structure etc. This is not yet addressed in prototype 2, and instead addressed in prototype 3.

#### **5.2.4 Reflection**

In conclusion, prototype 2 uses and applies the conclusions from the research on autism and embodied sensemaking found in 3.2 and 3.3. The roles of the embodied sensemaking can be explored further, though. Prototype 3 builds upon prototype 2, with the biggest change being the inclusion of specific content. Instead of a representation of what could be, prototype 3 is a hi-fi usable prototype. This is an opportunity to further incorporate the framework, focusing on specific interactions. That also means that during the development of this second prototype, the main focus lied on more general, global interactions. Because there is no content interaction to iterate on yet, the design choices are made with practicality and thematic reverberance in mind. In a sense, this second design cycle is about exploration, and pushing the boundaries as to what the toolkit could be. The first cycle is restricted in being built as a 'fix' to the current toolkit, and the third cycle is all about filling in the design, rather than iterating on the (physical form) design. Prototype 2 moves away from what is 'familiar' with the DYL toolkit. Change can be interpreted from both positive and negative angles. Some of the positive aspects are outlined above, but I also find that the new design (unintentionally) loses some implicit aspects that worked well with the current toolkit and/or prototype 1. For example, the idea of covering up past conclusions was observed in the current toolkit, and brought to the second prototype. This choice was interpreted as misguided during cycle 1, and as such was not incorporated into the first prototype. Instead, I argued that the first prototype can clearly display past conclusions, seeing as the kits were now self-contained, with a significantly reduced need for global processing. Essentially, there was 'more room' for visual input. This second prototype however, moves away from that. By iterating with a complete toolkit in mind, suddenly the display of 6 sets of conclusions had the potential to become overwhelming. While it worked for the individual kits like in prototype 1, the reality is that the user still has to interact with a 'complete toolkit' consisting of all parts. Reflecting on taking away all visible conclusions, I am not sure if the desired effect is worth the cost. Yes, the kit is not initially visually overwhelming, but the user has to go through the entire kit to reach past conclusions. In an attempt to take away potentially overwhelming global processing, a new problem was introduced. If the user wants to go back to past work,

they have to interact with the kit more, seeing as they now lack the option of simply taking a glance at the lid like in prototype 1.

### 5.3 Cycle 3

In this third and last cycle, the lo-fi iteration from cycle 2 is transformed into a fully-fledged, detailed hi-fi prototype. The main goal of prototype 3 is to include the content from the DYL toolkit and make a usable prototype that can be tested and evaluated. As such, its requirements are few, with the focus laying on designing and developing a detailed prototype.

#### 5.3.1 Requirements for the third iteration

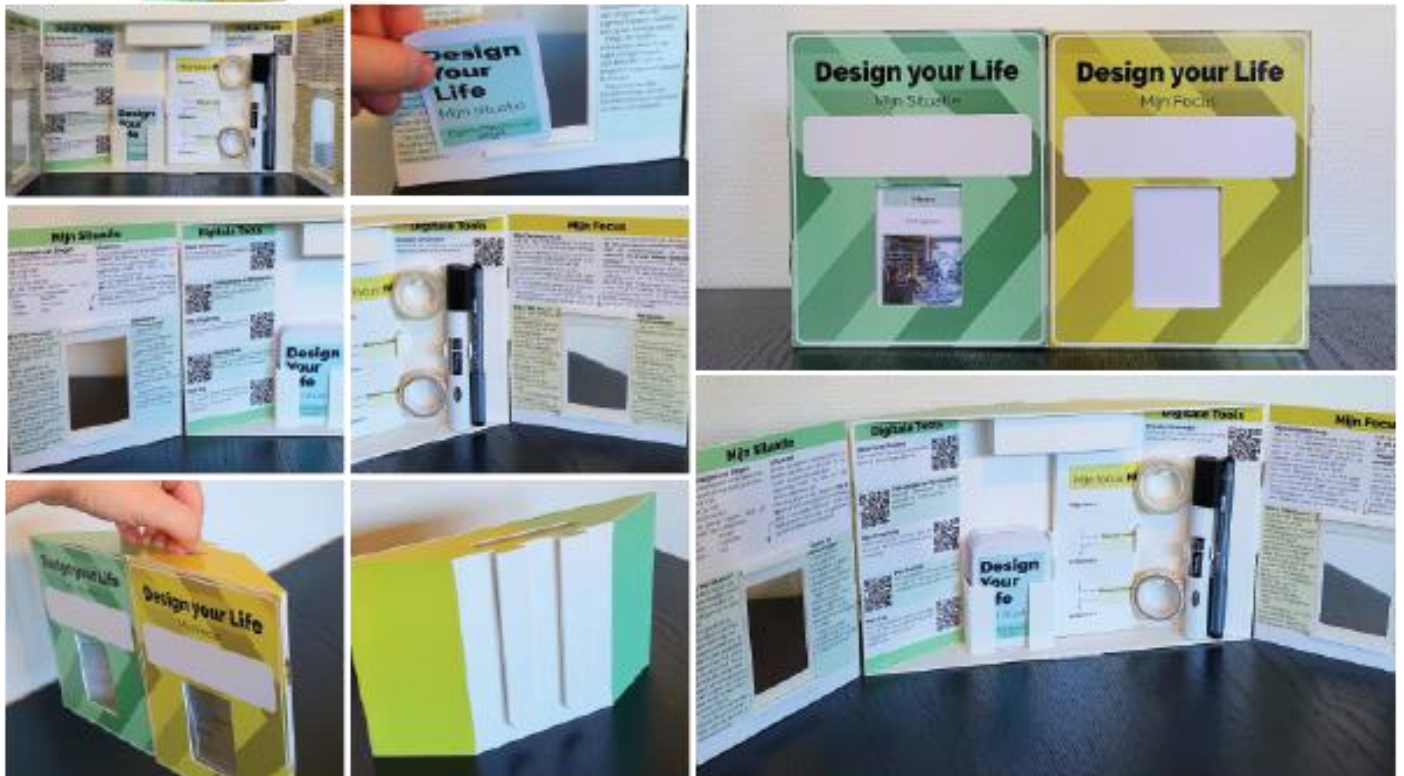
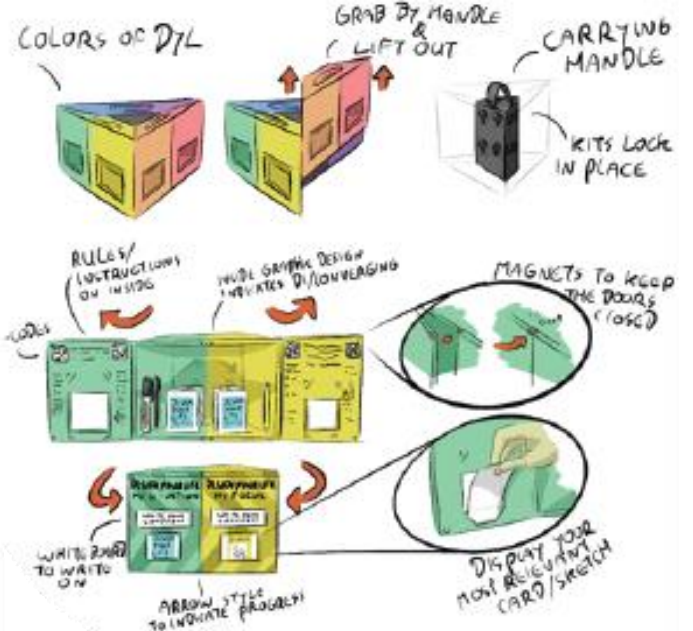
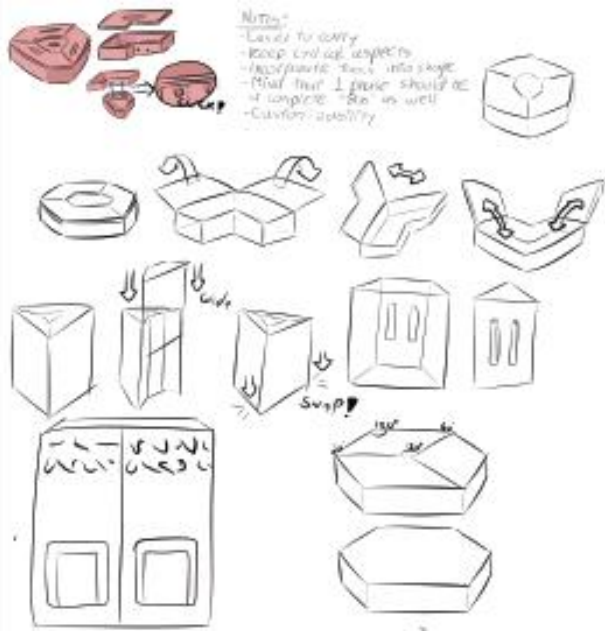
The third iteration is built on the base of the second iteration. The roles denoted in 3.3 are to be fulfilled, and the content of the toolkit outlined in 3.1 should now be incorporated to realize a fully-fledged, hi-fi prototype. These topics were then translated into requirements in 4.3. As a reminder, these were:

Requirements Cycle 3
<i>1. Incorporate well-received changes from iteration 1 and 2, while addressing feedback.</i>
<i>2. Have the ability to fulfil both role 1 and role 3 from the embodied sensemaking framework, with emphasis on role 3.</i>
<i>3. Include existing theoretical content, such as the tools, to the point where the prototype can actually be used.</i>

#### 5.3.2 Feedback on prototype 2

Prototype 2 was evaluated with a panel of experts in the field of design and embodied sensemaking. This panel was comprised of researchers that are currently leading the DYL project, and those who have worked on the project in the past. One notable part of the feedback was regarding the practicality of the total kit itself. While practicality during use was indeed addressed in prototype 2, the kit itself was still large, heavy, and clunky. Carrying and storage were two topic that were brought up, and prototype 2 was severely lacking in these points. To add onto the topic of practicality, an aspect that was questioned was where the user should begin. The toolkit is cyclical, so the user should theoretically be able to start anywhere. However, they should at least be informed on which starting point suits their needs best. The user can start with any of the kits, but the kits should clearly communicate their purpose with the user, but also communicate when to *not* use them, and start with the next phase instead. A third topic that came up was the central box, and its purpose. The central box was included to represent “my way & my world”, a ‘hub’ for the user to return to and to oversee the project as a whole, especially when cycling through the DYL process multiple times. While the intention was there, the practical purpose was still unclear.

### 5.3.3 Prototype 3



## Prototype 3

This prototype is an attempt to bring new value to the toolkit rather than merely fixing current problems, which is achieved through informing design choices by research on autism and embodied interaction. Each of the three requirements are the result of practical pain points. As such, to fulfil the given requirements, their corresponding pain points are addressed. Note: Requirement 1 is split into *two* pain points, since feedback on prototype 2 included two main pain points to improve upon.

**Requirement 1:** Incorporate well-received changes from iteration 1 and 2, while addressing feedback.

**Pain Point 1.1:** Prototype 2 is unwieldy and unpractical,

**Solution:** While the general design is similar to that of prototype 2, there are two major changes that solve the previous unpracticality. First, instead of being completely held together by magnets, the toolkit is now completely attached to a center spine. This spine has a handle on top that allows the user to very easily carry the entire toolkit around, with no worries as to whether the kit will stay together. The individual kits can easily be detached from the spine by lifting them up by the handle present on the roof of each of the kits. Until then, they are firmly held in place. Another major change to make the toolkit less unwieldy and more intuitive to use is the removal of the lids, and the introduction of the doors. By changing the ‘point of entry’ for each kit to the *side* rather than the *top*, the user no longer needs to interact with the lids at all, removing 3 (unnecessary) parts from the toolkit. In addition, by having the user now view the sides of the toolkit instead of the top, an earlier requirement from prototype 2 (“*The user should focus on one element at a time, and avoid having to make global overviews.*”) is further reinforced. The doors of each sub-kit close with the help of magnets.

**Requirement 1:** Incorporate well-received changes from iteration 1 and 2, while addressing feedback.

**Pain Point 1.2:** The central box from prototype 2 has no clear usage, and the user is not clearly informed on where to start when first using the toolbox.

**Solution:** The central box was meant to be a central hub for the user to return to, to help oversee the entire process and help self-reflect, especially since the user could go through the DYL cycle multiple times. However, after reconsideration, the actual practical usage of such a hub was questioned. While myself and the DYL team have discussed the overarching ‘meta’ view and purpose of the project on end, the reality is that the toolkit is meant to be just that; a toolkit. While the user could certainly go through the cycle multiple times, and learn more about themselves in the process, the toolkit is ultimately meant to help users make their own design solution. In addition, steps in reflection could be included in the last phase, since that phase is all about reflection already. Another purpose that the central hub had was to be a starting point for the user. However, it felt like this

would go against a big design choice made in prototype 1, to discard the bundle and to include its information into the toolkit itself instead. To me, the central hub started to feel more like a glorified first 20 pages of the bundle, rather than its intended purpose. As such, I decided to not include a central hub at all in the final design. Instead, the 3 kits would clearly display their usage case to the user, so that they could immediately get started instead.

**Requirement 2:** Have the ability to fulfil both role 1 and role 3 from the embodied sensemaking framework, with emphasis on role 3.

**Pain Point 2:** While the framework of embodied sensemaking, specifically role 1 and 3, is included in the design choices that lead to prototype 2, there is still room to explore these roles further.

**Solution:** Especially role 3 is now much more fulfilled. The new structure of the toolkit is based on conscious design choices, keeping in mind that when the user is working with one of the tools, everything else becomes part of the lifeworld. This is done through incorporating the signature style of DYL, including the colour choices, fonts, etc. In addition, this iteration includes the ‘tool conclusion’ system in prototype 1, where the user can choose the most relevant card or drawing and display them through the transparent doors. On the outside, the user can then write short conclusions on their experience with the tool. When a phase is finished, this is now indicated by having a specific card or user sketch in the window display (rather than the backside of the card set, which just says “Design your Life”) as well as the written conclusions. This becomes part of the lifeworld as the user moves through the design process, implicitly reminding them that this section is finished and closed. Yet, the user has easy access to quickly and explicitly read and reflect on past work. There is also something to be said about the point of access now being the on the sides of the toolkit. As a triangle shape, the user can only see one kit/phase at a time, again helping reduce an overstimulating lifeworld. Choosing what *not* to add to the lifeworld is just as conscious a choice as choosing what to add to it. Another design change from prototype 2 is the removal of a designated spot to put the phone. While the choice to include this in prototype 2 was informed and seemed like a fun, relevant addition to help merge the physical and the digital, it was hard to imagine the user actually following up on that. Putting the phone into the toolkit does nothing in terms of practicality. That said, the merging of the physical and the digital is certainly an interesting topic to explore. This is further discussed in chapter 6. As for role 1, the practicality of the toolkit itself being a tool is further developed as mentioned prior. However, it again does not form a sensorimotor coupling with the user in the same vein that a pen or marker can. One can question whether sensorimotor coupling can reasonably be pushed to such a degree in regards to this toolkit, which is also further discussed in chapter 6.

**Requirement 3:** Include existing theoretical content, such as the tools, to the point where the prototype can actually be used.

**Pain Point 3:** Prototype 2 has no content included yet.

**Solution:** The solution to this pain point does not require much reasoning. The content of the toolkit is simply translated into this prototype, seeing as the content itself is already well-researched and tested. That said, a conscious choice was made in choosing the tool for each of the six phases. Following the guideline set by the supervisors, the tools were chosen based on how completely they were able to represent the corresponding phases. On top of that, the tools that impacted the users lifeworld were prioritized, to help strengthen that aspect of the toolkit, and further fulfil its role as a “thing that makes up the lifeworld”.

### **5.3.4 Reflection**

In conclusion, prototype 3 further implements the takeaways from the research on autism and embodied sensemaking found in 3.2 and 3.3. Its design stays rather close to the overall idea of the second prototype. However, the design of the kits themselves stay somewhat more true to the design of prototype 1. By making small changes like making the kits face sideways rather than upwards, or selecting tools that specifically affect the lifeworld, the toolkit includes the well-received aspects of the first two prototypes while trying to bring aspects that were still underdeveloped to that same level.

### **5.3.5 Testing**

The purpose of testing the prototype with YAWA is to be able to reflect on the proposed changes with the user groups point of view as reference. To this end, openly discussing the prototype with YAWA is the preferred method of testing. The desired results are thoughtful answers and observations from the participants, where they can clearly communicate what they think works and what does not. It is paramount to consistently gather the participants’ opinions on the aspects of the toolkit as well as the design choices, and an open discussion format allows me to interject and answer their questions, after which they can substantiate their answers further. In addition, the complexity of the DYL project as well as the relative difficulty in ‘observing’ creative sensemaking make more quantitative and observation based testing less ideal. The ethical review and consent forms can be found in appendix 4 and 5. The test was performed with two YAWA that had no prior knowledge of the DYL project.

The test is divided into four phases.

1. Inform the participant about the DYL project and its purpose. Inform them that their perspective as YAWA can help me reflect on the effectiveness of the design choices present in the prototype.
2. Show the participant the prototype. They are asked to use it and explore it, but are not informed about the reasoning behind the design choices. Gather their initial impressions.
3. Inform the participant about why the prototype looks the way it does. Explain the rationale behind the design choices. Gather their perspective on those

rationales; whether they agree, what they would change, the degree of effectiveness, etc.

4. Show the participant the current DYL toolkit. Again, they are asked to use and explore it. Ask the participant to reflect on the answers given in phase 2 and 3, now knowing how the prototype changes the physical experience. Which changes work, which don't, would they change anything themselves, etc.

## **Results**

Overall, the participants had a positive reception to the prototype. They were able to reason why they agreed or disagreed with the design changes present, as well as denoting observations that I myself had not previously thought of. Although there were a lot of thoughts and comments, some observations stand out that came forward during the discussions with both participants. The full answers from the test can be found in appendix 6.

Both participants had a positive reaction to the concept of displaying conclusions on the outside of the door. After being informed about this being a conscious choice to prevent information overload and the need for global processing, they agreed that the desired outcome is reached, and that they much prefer this to the playing board from the current toolkit. One participant also noted that you can see into an unused toolkit, but you can no longer see inside once the conclusion is displayed. Once the toolkit is finished, it is truly 'closed off'. This is a new perspective to me, and it only helps reinforce the design choice. Another positive that was observed by both participants is that the reduced scale is much preferred. They had no observations or thoughts about the prototype being 'too big' or 'too small' before being shown the current toolkit. Once they saw the scale of the current toolkit, they mentioned that it has no clear starting point and that it (falsely) comes across as a board game. They also thought the bundle was very large and intimidating. As such, the choices of reducing the scale of the kit overall, splitting the kit up into 3 sections, and transferring the function of the playing board to the physical toolkit itself were supported and preferred.

There were also some design choices that were not well-received. Both participants preferred having the instructions separately in the bundle, rather than only being available on the inside of the doors. After explaining the rationale behind this decision, one participant argued that they would at least want to have the instructions separately as well. Not necessarily in the form of the current bundle, but perhaps as the playing card on top of the stack, or a small booklet. Another aspect that both participants found lacking was the presence of an explanation. They were able to understand where to start and how to use the toolkit, but they noted the absence of an explanation about DYL in general. At the beginning of the evaluations, I did explain DYL to the participants, so the toolkit did ultimately make sense for them. However, the toolkit should be able to 'explain itself' without needing myself or anybody else to explain it, outside of this testing scenario. This is the result of the exclusion of the bundle. A last, more practical feedback point, is that the physical design of the tools could use another pass. They have no clear way to open and close. The results of the testing are reflected upon in chapter 6.

## 6 Discussion

At this point, I will reflect back on the research questions. As a reminder, these were as follows:

### *Main Question*

How can physical form-giving contribute to creative sensemaking in assisting people on the autism spectrum in designing their own tools?

### *Sub questions*

1. How can a physical artefact assist creative sensemaking?
2. How can the lens of embodied sensemaking help expand the toolkit?
3. To what degree does autism affect creative sensemaking and physically experiencing the toolkit?
4. Given the answers to sub questions 1, 2, and 3, how can this be materialized in the form of an evaluable prototype?

Starting with the sub questions; *How can a physical artefact assist creative sensemaking?* A physical artefact can act as a representation of the users sensemaking. They can use it to store thoughts and ideas, like with a white-board, or to keep track of a process, like with a planner. The user gains the opportunity to clearly see their own design process and reflect back on it. This kind of reflection can help the user gain new insights, and stimulate creative sensemaking. I have found that by virtue of being a tool that the user works with, the tool itself informs the users sensemaking as well. If two hypothetical identical YAWA use two different variations of the same toolkit, they will have a different experience, which thus differently informs their thought process. The physical artefact, as simple as it could be, inherently carries value in affecting the users' sensemaking, for better or worse. The evaluation with YAWA showed that two toolkits with identical content come across completely differently to the user, affecting their understanding of the content as well as their willingness to engage with said content. In short "looks matter", but so does tangibility.

An artefact can thus be more than just an object of representation, which relates to the second question; *How can the lens of embodied sensemaking help expand the toolkit?* Using van Dijk's framework (Van Dijk, 2023), a physical artefact meant to assist a design process can be pushed to stimulate deeper creative and conceptual thinking. By inhabiting the roles of becoming an extension of the body, and/or (partly) becoming the users lifeworld, a physical artefact can contribute to a design process beyond merely fulfilling the role of representation. As such, the lens of embodied sensemaking can help expand the toolkit through fulfilling roles beyond representation. For example, dividing the toolkit up into sections reinforces the idea that the user can put the tools that they are working with in the 'foreground' (explicit sensemaking), whereas they can put the tools or even the toolkits that they are not working with in the 'background' (implicit sensemaking). This sequence of logic was well understood and supported by the YAWA evaluators as well, which helps support the theory that designing with the role of the lifeworld in mind can help push the kit further than merely being a representation of the process. Looking back, I find that



perhaps the idea that the given examples from the paper (a whiteboard, or a notebook)(Van Dijk, 2023) do not fulfil these roles can be questioned. As mentioned prior, design choices affect the users sensemaking. If you give the two identical people two near identical notebooks, with the one difference being the colour, they will still have a different experience. Perhaps all tools fulfil the roles presented in the framework, but to different degrees. Rather than being a ‘checkmark’, the degree to which the three roles are fulfilled can be seen as a spectrum.

Then we arrive at sub question 3; *To what degree does autism affect creative sensemaking and physically experiencing the toolkit?* YAWA exhibit traits that affect the way in which they experience ‘things’ (Fletcher-Watson & Happé, 2019). To bring it back to embodied sensemaking, these traits affect the cognition of YAWA. Hypo- and hypersensitivity is a trait commonly associated with autism, and fundamentally affects sensemaking. For example, a visual trigger may elicit a positive reaction from the neurotypical population, but people that are hypo- or hypersensitive to (that kind of) visual trigger may not elicit the same response. This in turn affects the way that YAWA experience sensemaking, and in turn, a physical artefact such as the toolkit. To give an example where the current toolkit was already partly designed with this aspect in mind, the colour palette was a very conscious choice by the DYL designers, particularly focusing on striking a balance between not being too overwhelming, while avoiding a look that is ‘too clean’ to the point of disinterest. The evaluation showed that the desired effect was reached, seeing as both participants had a positive reception. Another trait to consider is visual processing. Relative to the neurotypical population, YAWA exhibit a greater ability to detect specific visual elements in a group of visual elements, and keep focus on that specific one. On the other hand, the ability to observe and make sense of visual elements in a global fashion is inhibited. An example of applying this theory is by taking the colour palette theory from the current toolkit, and pushing it further. If the tools are going to be organized by colour, then why not divide give them their own sections entirely? The prototype has all tools in their respective spots, making for a clear and organized overview. When comparing the prototype to the current toolkit, both evaluators had a negative reception to the lack of organisation in the current toolkit, especially in comparison to the prototype.

*Given the answers to sub questions 1, 2, and 3, how can this be materialized in the form of an evaluable prototype?* Question 4 requires all prior theory to be applied to an evaluable prototype. I translated the research on the DYL toolkit, autism, and embodied sensemaking into three sets of concrete design requirements that when met, can be tested and evaluated with the userbase. The full list of requirements can be found in chapter 4.4. In my case, the prototype was then compared with the current toolkit, and whether the proposed prototype was found to actually improve the user experience.

Regarding points of improvement, my main gripe is with the research on autism. Coming into this thesis, the original intention was to find design principles in how to design for YAWA and apply these to the toolkit. The focus was much more centred around the autism aspect at the time, rather than the embodied sensemaking aspect. Because autism by nature is heterogeneous, finding these design principles proved to

be difficult. Designing for autism is different than designing for a neurotypical userbase. In that realm, clear design principles exist as a result of the userbase being more homogenous as opposed to heterogeneous; the userbase simply has a more streamlined and common general experience. Expecting the same to be true for YAWA proved to be shortsighted as a result. While I was able to outline some concrete traits that are commonly found in YAWA that *also* directly affected design choices, these are only a couple of examples. I think there is much more to be explored in regards to the topic of 'how to design for autism', to the point that its scope is beyond this case-study with the DYL toolkit.

Another important aspect to discuss was the application of van Dijk's framework. In the end, role 3 (things that make up the lifeworld) became the centre focus, rather than an equal division between the three roles. Part of this is the conscious exclusion of role 2 (things in participatory sensemaking), seeing as the participatory factor of DYL was excluded from this research. Role 1 (Sensorimotor couplings) was taken into account however, but not nearly as fleshed out as role 3. The reason for this is because sensorimotor couplings are made with physical tools. At the start of this research, my supervisors and I talked about potentially including more 'real tools' in the DYL toolkit. The idea made sense at the time, since it was strange to me that a toolkit had such limited physical tools in it. However, by getting to know DYL better and working on this research, I realized that including real physical tools into the toolkit is a lot more complex than it sounds. The inclusion of tools inherently limits the users solution to the capabilities of the provided tools. As such, I propose that a true 'toolkit' in the sense of the word should be something that DYL is not. I think for it to be a truly enhancing and worthwhile experience, phase 4 of this toolkit ("*Mijn Oplissing*" (My Solution)) could have its very own toolkit. This can take any shape or form, from a simple box of crafting material, to a drawing tablet that can 3d print on the spot, to an entire room chock full of supplies and inspiration. In the end, foregoing the addition of 'real tools' is a loss of potential. Yet, I reason this by saying that its sheer amount of potential means that whatever tools I would come up with, I would not be able to see it to fruition to the degree that I know it could, especially when taking into account that this is 1/6<sup>th</sup> of the DYL toolkit. I do, however, think that putting effort into exploring and developing this space in the future could be very exciting.

Then, there are some more minor aspects to discuss. The merging of physical and digital is one of those. In cycle 2, I made an attempt to try and include the digital aspect into the physicality of the toolkit. However, I scrapped that going into cycle 3 because it felt forced and unnecessary. This is a similar case to the 'real tools' conundrum, where I feel that a potential merging between physical and digital is something that should be explored on its own. Both sides were being researched and worked on independently (with myself working on the physical side), meaning that there was an inherent separation. There was potential to fuse these two researches, to make for a strong and well-developed connection between the two. The main reason why this did not take shape is because of practicality issues. If the toolkit already had a well-developed physical *and* digital platform, then I do think that this would have been worth attempting. Another aspect scrapped from cycle 2 is the central hub. Ultimately, it comes down to what I want to present to the user. The meta-discussion

of getting to know oneself through cyclical research, and going through the DYL cycle time and time again to refine designs or perhaps come up with alternative or completely new designs is something that I often discussed with the other DYL researchers. While this is of course of great interest to us as researchers, I also had to keep the goal of the user in mind. Why would YAWA want to use this toolkit? I reckon that the goal of the toolkit, allowing YAWA to design their own tool, should be at the forefront. Taking away the central hub allows the user to immediately start, and keep their focus on the solution, rather than the reflection. This choice does not feel like something that is correct or incorrect, rather I see it as a case of perspective.

## 7 Conclusion

This thesis starts off with an analysis of the DYL (Design your Life) toolkit, the current product of the ongoing DYL research. The DYL toolkit contains methods and tools to help young adults with autism (YAWA) with making their own personal tools. These tools are meant to help YAWA navigate their life in a world that may not accommodate for their specific wants and needs. The toolkit is built on a strong foundation of research by the DYL team, but the physical form of the toolkit still had room for improvement. A thorough analysis of the toolkit was performed. This resulted in three main critiques; a lack of practicality, a disconnect between materials, and an underutilized playing board. By addressing these issues through design changes, the toolkit could have a greater ease of use, allowing the user to fully focus on the content, rather than dealing with potential design hiccups.

As opposed to resolving current issues, there was also untapped potential in un(der)explored areas that the toolkit could benefit from. The concept of designing for autism was researched, which mainly concluded that designing for a heterogeneous condition is tricky by nature. However, there are some more general aspects of autism that could be taken into account when designing a product to be used by YAWA. A design should make use of YAWA's enhanced visual processing, while steering clear of requiring global processing of multiple visual elements simultaneously. It should not be too overstimulating as to avoid triggering hypersensitivity, but also not fall into the trap of becoming too boring or 'clean' in order to maintain engagement and interest. In addition to designing with autism in mind, the experience of using the toolkit could also be pushed further by applying theories on embodied sensemaking. More specifically, an embodied sensemaking framework that focuses on pushing assistive technology beyond mere storage and/or representation of ideas and progress. This framework proposes that assistive technology can move past this limitation by fulfilling the role of "Sensorimotor couplings", "Things in participatory sensemaking", and "Things that make up the lifeworld".

Using "Research through Design" as a method, these theories were procedurally applied to 3 rounds of prototyping. The first round of prototyping had the purpose of resolving the surface shortcoming of the current toolkit in an attempt to unearth more deep-rooted issues as well as starting off the prototype cycle. This prototype was reviewed along with three members of the DYL team. The feedback points of this review session were used as input for the second prototype. The purpose of the second prototype was to move past merely addressing current issues, but also to start incorporating added value by applying the research on autism and embodied sensemaking. The product was a lo-fi prototype, that was then discussed with both current and past members of the DYL research team. Again, feedback points from this discussion were used as input for the third prototype. Finishing the prototyping sessions, the third prototype was to be a hi-fi, fully functional product that built upon both the literature research as well as the conclusions gained from past prototypes. Its main purpose was to be evaluated with YAWA in order to garner feedback on the degree to which the changes to the toolkit affect the users experience.

In conclusion, on the practical end, the DYL research project is provided with a new and improved toolkit, with changes aimed at resolving issues with the current toolkit, but also aimed at introducing new value to the toolkit. In addition, this is a case-study on physical form-giving affects creative sensemaking in people, and how changes to this physical form-giving can contribute to creative sensemaking when applied to assistive technology aimed at YAWA.

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# Appendix

## A1: Notes on the current toolkit

### ALGEMENE NOTES:

- De stappen zijn significant anders in grootte, met name mijn situatie die enorm is. Misschien geeft het een verkeerd idee over de scope van de opdracht?

### Toolkit

- Mijn Situatie
- Mijn Focus
- Mijn Ideeën
- Mijn Oplossing
- Mijn Test
- Mijn Inzicht

### Voorbeelden

#### “Blader maar eens door”

- Te overweldigend
- Boek pagina's lopen niet altijd goed door
  - Bundle
- Tabbladen
- Bookmark

Waarom doen? -> hoort dit voorop?

Inconsistentie tussen zakelijkheid en kinderachtigheid

Pagina 4 -> kleurvolgorde regenboog definiëren

Pagina 5 -> Verzamel de toolkit > Foto's!!!!

Balans tussen voorbeeld en vrijheid -> Ipv “Dit kan”, “Zo zou dit kunnen”

### De medeontwerper

- Instructies in de bundle zelf? Of apart?
- Footnotes met secties en paginanummer niet intuïtief

Intro#4 vraag over technologie > Is dit de goede aanpak?

Intro#5 strip het eigen menu. Dit kan geïntroduceerd worden aan het eind van het basismenu

“Haal de gekozen activiteiten uit de bundel en verplaats naar het tabblad “Mijn activiteiten” > Overweldigend, niet intuïtief, forceert de gebruiker om nu al een overzicht te hebben

Dit kan vertaald worden naar een korte introductie aan het begin van de stappen, waarin wordt uitgelegd wat de stap inhoud en wanneer deze overgeslagen zou kunnen worden

Keuzemenu's: Anders structureren. Misschien met een soort ‘nakijkmodel’, een doorzichtig tabblad wat je over de stappen kan leggen om jou persoonlijk plan te kunnen zien.

- Basismenu en eigen menu: basis en uitgebreid. Dit moet beter. Hoe?
- Integreren in het bord zelf
- Blokjes, rondjes, uitroeptekens, deze moeten ook bij elke stap in het boekje te vinden.

Plastificeren zodat er met een stift omcirkeld kan worden?

Denk-Ding -> helpen bij cognitieve taken, minder nadenken

Wekker, memobord, agenda, etc. etc.

Vertel-ding -> Alles waar anderen een rol in spelen

Whatsapp, Signaleringsplan, Social Media, Gedeelde agenda, Email

Herken-ding -> Emotionele waarde

Knuffel, Idool, Artefact met herinnering, tools voor hobby's en interesses,

Eigenschap kaarten > Moet op het bord, niet in de kaartstapel

- Fijn, oke, niet fijn > Maak een schaal van 1 tot 10 ofzo, perfect tot verschrikkelijk

Uitdaging en strategie kaarten > Moet op bord, niet in de kaartstapel > Maak 2 stapels

- Uitdaging kaarten te globaal, en te veel
- Misschien 1 strategie kaart per uitdaging? Strategieën misschien meer loskoppelen van elkaar
- Houd rekening dat een strategie voor meerdere uitdagingen gebruikt kan worden

Moet alles in kaarten? Of andere methoden? Think

Medewerker tips herstructureren > leg de nadruk meer op hoe de medewerker een barrière of stilstand kan doorbreken bij de ontwerper, in plaats van constant itereren dat ze niks mogen invullen

Planning aan het begin van de bundel, met tijden en welke voorbereiding nodig is per sectie. Zodat je geen situatie tegenkomt waarin je onvoorbereid bent of onvoorzien niet verder kan

Mijn omgeving > Teken

- Legenda veel uitgebreider in het voorbeeld.
- Afronden staat op de optionele pagina?
- Omgevings canvas niet intuïtief bewaarbaar
- Reflectie is te kort door de bocht. Mag best uitgebreider geanalyseerd worden.
- Mijn belangrijkste conclusie is: Moet gestructureerd worden. Waar vul je het in?

Misschien een proefrondje? Zodat het circulaire proces duidelijker wordt. Misschien na het proefrondje de opdrachten kiezen waar je mee wil werken.

Mijn Ervaringen

- Waarom zijn er zoveel datakaarten? 3 nodig max
- In de bundel wordt veel naar de 'kaart' gerefereerd. Welke kaart?
  - Geen duidelijke plek/vakje voor de plek
  - Waarom zoveel tijd opties als je er maar 3 kiest?
  - Te weinig ruimte om dingen in te vullen

- “Gebruik als inspiratie” Te vaag. Mag een stuk concreter gelinkt worden aan het ontwerpproces. Daarnaast, je bewaart de kaarten in een gesloten vakje waar je het niet eens kan zien of in beeld hebt.

#### Mijn Dag

- Lijkt erg op mijn ervaringen, maar dan met de focus op activiteiten ipv dingen.
- Misschien een stuk eerder? “Wat wil je verbeteren” hoort toch voor “Hoe wil je het verbeteren” (Hoe pak je dit aan in een voorbeeld situatie?)
- Als het 1 dag is kom je problemen tegen; wat als iemand een duidelijk goede of slechte dag had?

#### Terugblik

- Kinderachtig met smileys? Vooral in contrast met het ‘klinische’ van de rest
- Algemene opmerking: Refereer actief terug naar de terugblik gedurende de rest van de toolkit
- Waarom doet de medeontwerper dit ook

### MIJN FOCUS

#### Mijn ontwerpvrage

- Misschien een beetje theorie over het ‘ontwerpproces’ en het nut van een hoofd- en of deelvraag?
- Waarom herformuleert de medeontwerper
- “Ik wil werken aan” is dit een goede focus? Het is proces gefocust en niet oplossing gefocust, het kan ervoor zorgen dat de eindoplossing geen nut gaat hebben, omdat je prioriteit geeft aan het ding waar je graag aan wil werken, ipv het ding waar je een oplossing voor wil/nodig hebt
- 5 waarom vragen. Kun je hier een nummer aan linken? Gedachte is wel goed
- Misschien een voorbeeld bij de focus -> verfijnde focus stap. Vooral na de 5 waarom vragen kan het best moeilijk zijn om je focus zomaar te verfijnen

#### Situatie generator

- Te veel kaartjes (Niels mee eens)
  - 7 categorieën: Niet georganiseerd
    - Waarom zijn er niet 7 decks?
- Met lege kaarten erbij zijn het 8 categorieën...
- Waarom is dit in kaartjes? Waarom kun je deze vragen niet gewoon beantwoorden?
- Kan een enorm grote stap worden als je het letterlijk opvolgt. Tientallen kaartjes kunnen bv relevant zijn.
- Afronden: De gebruiker legt aan de medewerker de keuzes uit. Is het niet de bedoeling dat ze er samen doorheen werken?

#### Terugblik -> Zie Mijn situatie

- Terugblik is misschien niet specifiek genoeg per sectie. Elke sectie heeft zijn eigen content, dus misschien moet er op een specifieke manier teruggeblikt worden per sectie.

### MIJN IDEEËN

Wat kan het idee zijn? Moet het een tool zijn, of kan het ook een dienst of proces zijn?

Misschien belangrijk dat tijdens de evaluatie de keuzes hier opnieuw worden bekeken

Het bouwt in theorie heel logisch op elkaar, maar dit wordt niet begeleid of zelfs genoemd

Volgorde klinkt niet volledig logisch: Waarom wordt er pas bij “Ideeën kiezen” een knoop doorgehakt wat betreft 1 duidelijk idee volgen

Opwarmen

- Dubbelzijdig? Is dat wel een goed idee, als het door gaat drukken
- Als de focus wordt opgeschreven, refereer CONCREET naar de focus-fase
- Algemeen overzicht dat aansluiting van fases toont.
- GOEIE STAP!

Mijn functies

- Veel verschillende soorten kaartjes binnen 1 deck
  - Opsplitsen? Moet dit allemaal in kaartjes?
  - Met name sorteerkarten “Moet” en “Mag” hoeven niet per se kaartjes te zijn
    - De andere soorten zijn
    - Opbergen
    - Locatie
    - Activeit
    - Doel
    - Leeg
- Moscow strategie: Requirements opstellen
- De kaartjes zeggen allemaal “moet”, misschien naar de passieve vorm? Omdat moet ook een sorteerkart is
- Voorbeeld geven voor de lege kaarten, aangezien het volledig carte blanche is

Mijn Eisen en onderdelen

- Goed duidelijk maken wat het verschil is tussen mijn functies en mijn eisen en onderdelen
  - Functional vs non functional
    - Eigenschappen vs nut

Mijn omgeving aanpassen

- Terug refereren naar mijn omgeving canvas?
- Ervanuit gaande dat de ruimte regelmatig toegankelijk is en dat er ook kaartjes achtergelaten kunnen worden
- Hoe ziet dit eruit?
- Gemiste kans voor een andere vormgeving dat kaartjes, aangezien er zelfs al wordt aangeraden om bijvoorbeeld plakbriefjes te gebruiken.
- Concretere conclusie; de opdracht mist een duidelijke afronding
  - Bewaren voor de evaluatie later? Geld voor heel “Mijn ideeën”

Schetsen

- Refereer terug naar de inspiratie stappen
- Canvas is een blanco papiertje
  - Gemiste kans!!!!!!
- Hoe haal je hier een conclusie uit?

## Hulplijn

- Refereer concreet naar mijn eisen om het canvas in te kunnen vullen
- Hoort dit na het schetsen?
- Hoe weet je of de oplossing aan de eisen voldoet? Is het probleem opgelost? Ben je nu klaar?
- Kan gebruikt worden voor het brainstormen, maar ook het realiseren

## Mijn droomoplossing bouwen

- Wie heeft dit gemaakt en waarom
- Zet de gebruiker heel erg in een box
- Leunt direct naar digitaal
- Content is goed, maar de tools niet

## Mijn droomoplossing gebruiken

- Hoezo moet de medeontwerper het gebruiken?
- Hoe werkt het 'inleven' en het 'roleplay' aspect met autisme?
  - Misschien niet helemaal een concern
- Waarom gaan we terug naar de eisen?
- Origami

## Mijn ideeën kiezen

- Waar is het canvas? De toolkit mist het canvas
- Waarom eisen opnieuw
- Canvas samenvoegen met hulplijn
- Wat gebeurt er als geen van de ideeën aan alle eisen voldoet?
  - Terug reflecteren en opnieuw die stappen volgen; of doorgaan met het 'beste' idee

## MIJN OPLOSSING

### Expert netwerk:

- Kaartjes combineren met de hulplijn kaartjes?

### Plan van aanpak

- Verzamel "Jouw oplossing-idee" -> Dit kan een heel concreet iets zijn
- Volgorde in "uitvoeren" klopt niet, en misschien gewoon naar een abc model?
- 5. en 6.; misschien verduidelijken dat controleren of de oplossing werkt GEEN test is. Dat het in principe alleen even checken is of alles het doet.
- PVA past niet in het ontwerp bord
- Maken, aanpassen, combineren: Wat zijn de stappen? Misschien een voorbeeld?
- Het is een beetje bare bones. Uitbreider uitleggen

## MIJN TEST

- Gebruikertest: Waarom zo? Waarom niet een gewone reflectie na een testperiode? Is dit ooit al uitgevoerd, en zo ja, wat waren de resultaten?
  - Bind het aan de assistive technology, misschien een sticky note ofzo
  - Zodat het in zicht en in mind is, maar alsnog niet de flow breekt.
- Veldonderzoek: Prima

## MIJN INZICHT

Het hele verhaal van "design is iteratief" mag wel aan het begin van het hele boekje.

Waarom wordt het veldonderzoek boekje niet DIRECT gereflecteerd? Zonde, vooral omdat dat nu nog vers in het hoofd van de gebruiker zit.

Mijn testuitkomst:

- Waarom gebruiken we niet de “Mijn ideeën” Mijn omgeving aanpassen en Mijn functies kaarten? Pak daarvan de gekozen kaarten erbij, en reflecteer of de doelen goed zijn bereikt.

Veranderingen opmerken: Zelfde, maar dan met de “Mijn functies” kaarten van mijn ideeën.

- Mag wel iets van een tool bij, een canvas ofzo, dat begeleid hoe je deze stappen doorloopt

De oplossing in mijn leefwereld:

- “Verbeteren” suggereert dat de volgende stap in principe een herdesign van je huidige design is. Stel je slaat compleet de spijker mis, dan moet het misschien verwoord worden als ‘Wat werkt en wat werkt niet voor mij’, zodat je die inzichten mee kan nemen naar de mijn situatie of mijn focus fase.
- Voorbeelden hebben ini mini tekst.

De Oplossing eigen maken:

- Zijn deze stappen (oplossing eigen maken/de oplossing in mijn leefwereld later/door iemand anders gemaakt dan de eerste 2. Deze maken gebruik van voorbeelden bij invullen canvas/los van kaartenspellen.
- Waarom wordt dit in de evaluatiestap gedaan en niet bijvoorbeeld eerder? Is het niet beter om dit in een eerdere stap te doen, zodat deze influences al meegenomen kunnen worden voordat de oplossing is gerealiseerd?

Evaluatiematrix

- Dat zijn flinke sticky notes (te groot) Waarom niet gewoon schrijven?
- “Bedenk 3 dingen die je wil veranderen” Stel je wil niks veranderen, ga dan door naar de volgende stap?
- Waarom is dit een schaakbord? Zijn het 4 aparte vakjes, or moeten we hierover denken als een schaal? Misschien duidelijk maken met een voorbeeld

AFRONDEN DIT IS GEEN STAP IN HET BORD???

Mijn uitkomst

- Canvas een beetje dubbel, wat moet precies waar opgeschreven worden? Niet intuïtief, duidelijk maken wat waar hoort.
- Motivatie en reden waarom we deze stap langslopen

Terugblikken

- Voor Mijn Uitkomst?



## **A2: Analysis of the current toolkit**

### **DYL Toolkit Analysis**

In its current iteration, the DYL Design your Life toolkit is a functioning medium to help autistic people in developing their own design solutions through codesign with a partner. Through a variety of research-based methods, the designer is taken through a number of steps that (can) assist them throughout the design process. Depending on the starting point, but also their wants and needs, the designer should be able to step in at any of the 6 design stages, using the materials that they can use and discarding what they cannot. The current iteration of the toolkit brings a number of strong points, but there are also areas for improvement, both on the content- and functionality wise.

### **The Scope**

The first and most apparent roadblock when starting out with the toolkit is the scope. The toolkit itself has a gameboard, stacks upon stacks of playing cards, a bunch of stickers and pens, and of course the bundle. The bundle itself brings the scope issue to a peak, seeing as opening it for the first time quickly becomes overwhelming with the amount of pages and information that the user needs to process. It doesn't help that there is not clear and concise statement about what the kit is and how it works. While there is an argument to be made about informing the user as they progress through the process in order to prevent information overload, the current iteration fails to do so, always leaving the user waiting and anticipating further information to make the entire process a little bit more clear.

On the topic of scope, there is the question of how big the toolkit, and to an extent the design process, needs to be. While there is no definitive answer to this, I did find that the toolkit was very front-loaded in content and methods. The first stage of design (my situation) contains more than double the methods and time required to complete it compared to the other methods. This doesn't necessarily need to be a problem, but it does induce the feeling that the design process is much larger and more overwhelming than it actually is when working through the first stage. In addition, while the methods themselves do come across as useful, there is definitely overlap in the conclusions that the user can draw from these methods. Why would I participate in three methods instead of one, when all three end in me drawing the same conclusion?

### **Flexibility**

The other core issue of the current iteration is the concept of flexibility. Perhaps this could even be the root of the scope problem, seeing as the bundle continuously suggests and encourages the user to stray from the 'rules' and the 'structure' if they so desire. The core idea behind this is admirable and sound to me, seeing as it plays into the idea that everyone with autism experiences it differently, and thus has different needs. The execution of this flexibility is where the toolkit drops the ball. There is always going to be a balancing act between applying structure and allowing flexibility, but the balance teeters too far away from applying structure. In addition,

by constantly suggesting that the user can discard certain methods or take their own approach, it somewhat cheapens the content and makes the user wonder which parts are actually important. It also leaves the user hanging too often by encouraging the option to divert, but not making any kind of suggestion or indication as to what that diversion could or should look like. To me, it makes the toolkit come across as tentative, unsure, and almost apologetic about its content. As a hypothetical user, if I'm going to devote my time and attention into this kit developed by the brightest minds that a university has to offer, I'm going to expect it to be confident that its methods are helpful, correct, and stimulate me to participate, since it should be able to help me move forward!

When going through the toolkit, I found myself looking for and wanting structure, in order to navigate the various methods and start forming a clear idea of what the designing process was going to look like. Yet, whenever semblances of clear structure were introduced, it was usually immediately followed by a statement indicating that the user may also deviate from the structure if they so desire. For example, when the 6 stages of design are introduced as a concept, it gives the user an idea of what this process is going to look like for them. However, it is immediately followed by the suggestion that the user can cut out parts that they don't like or need, and that they can start at whatever stage is appropriate to them. It doesn't help that a similar situation arises for nearly all parts of the process, i.e. custom cards for every playing card methods. Flexibility can be a strong and attractive facet in the DYL toolkit, but the application and its relation to structure is something that needs to be reconsidered and 'restructured'.

### **Physicality and the Design of Methods**

Lastly, there is the physical functionality of the toolkit. While it works in its current iteration, there are tons of opportunities waiting to be explored. Currently, the toolkit is somewhat catered to its core audience; young autistic individuals. For example, the methods are colour coded, and the colour palette is somewhat muted to prevent overstimulation. We can take this so much further however, both on a larger scale and by finetuning current design solutions. On the larger scale, I would ask questions about the current design such as;

*“What is the use of the gameboard?”*

*“Why is nearly every method some type of card game?”*

*“Where are the tools?”*

*“Does this iteration support and accommodate for the creation of (rough) prototypes?”*

This can then lead to questions exploring solutions specifically catered to the target group such as;

*“What medium works best for autism when storyboarding an ongoing (design) process?”*

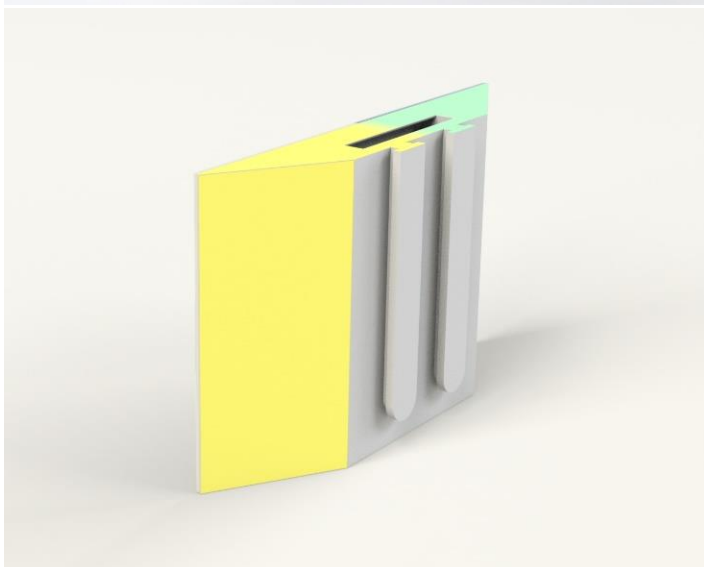
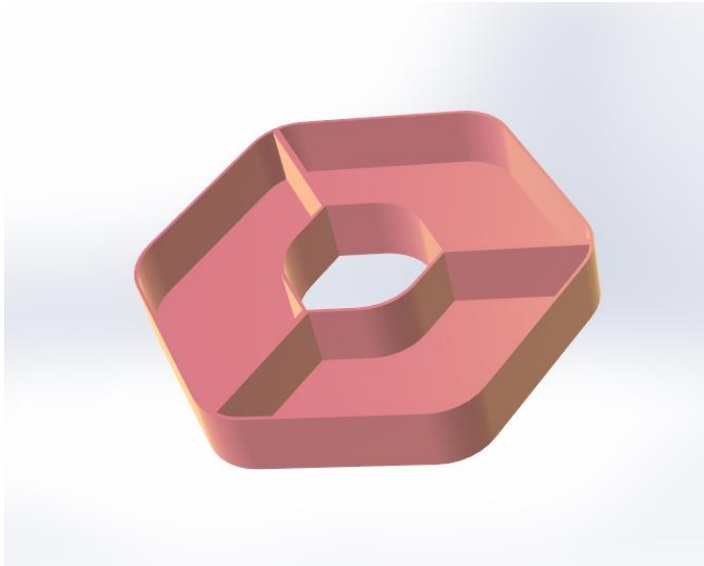
*“How does physical sensemaking for autism inform the ability to immerse oneself in a method/game?”*

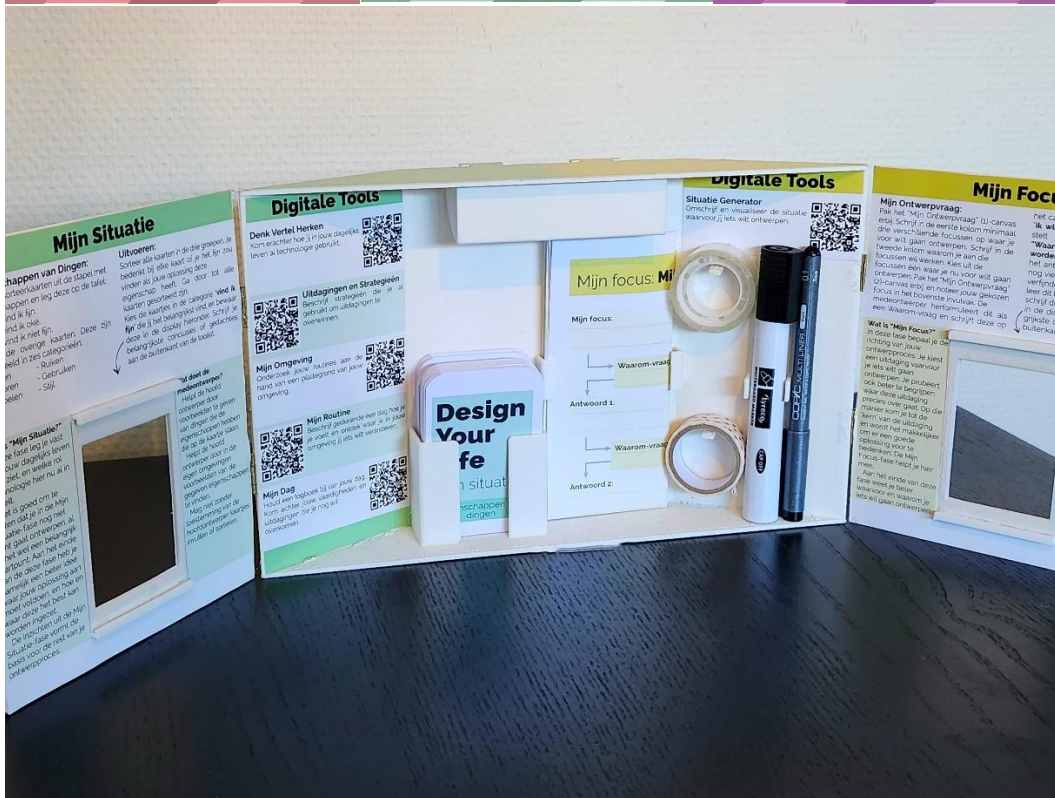
*“How can we approach and use hypo/hypersensitivity in autism to our advantage when designing physical tools and potential prototype parts?”*

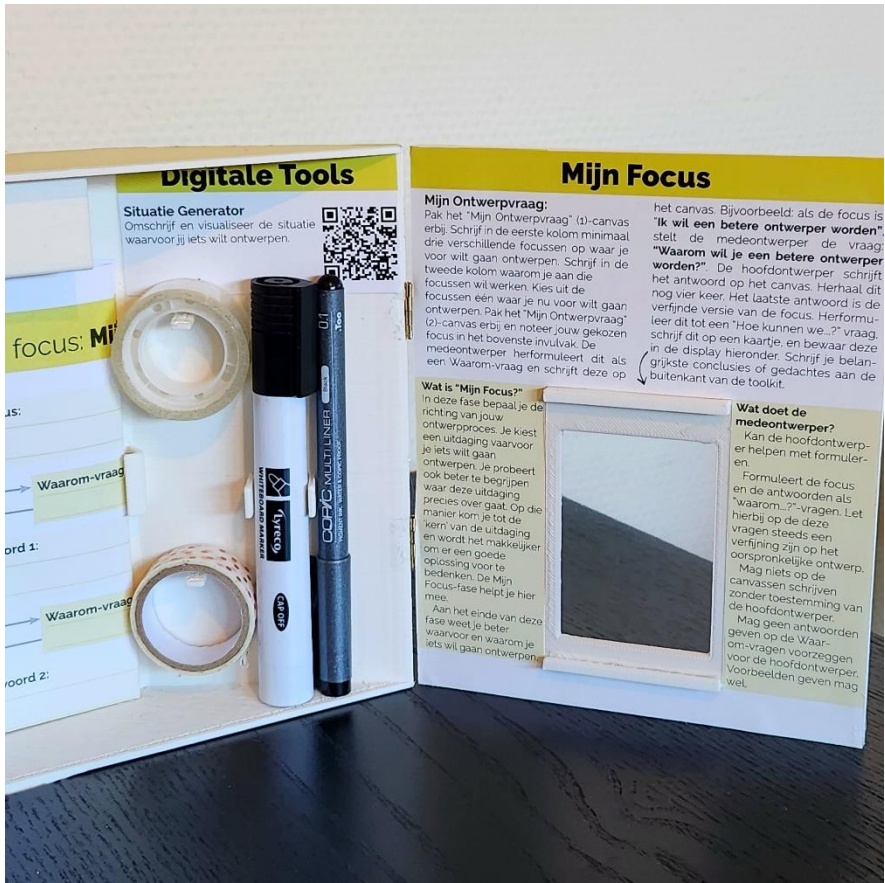
## **Summary**

All in all, the DYL toolkit is a working toolkit that can benefit from a number of quality of life updates. The content in and of itself is sound and research based, and as such, I don't see a need of changing or introducing new content. However, I do think the toolkit can benefit from considering cutting out certain methods that overlap with others in the *outcome/takeaways*. In addition, the structure around these methods and the way that these methods are presented to the user, that is where I think an overhaul is needed. Early on, the user should get a clear idea of what the design process is like and what the 6 design stages cover. With this information, they should then be able to make an informed decision on which design stages and which methods they think are going to be useful. This also helps solve the scope problem, as it cuts away all parts of the process that the user is not going to need. It would be great if this can be reflected in the physical toolkit itself, by literally taking away the parts that are unnecessary. As such, the user can divert their full attention to the relevant parts.

### A3: Other renders







## Digitale Tools

### Situatie Generator

Omschrijf en visualiseer de situatie waarvoor jij iets wilt ontwerpen.



focus: Mi

as:

→ Waarom-vraag

oord 1:

→ Waarom-vraag

oord 2:

## Mijn Focus

### Mijn Ontwerpvraag:

Pak het "Mijn Ontwerpvraag" (1)-canvas erbij. Schrijf in de eerste kolom minimaal drie verschillende focussen op waar je voor wilt gaan ontwerpen. Schrijf in de tweede kolom waarom je aan die focussen wilt werken. Kies uit de focussen één waar je nu voor wilt gaan ontwerpen. Pak het "Mijn Ontwerpvraag" (2)-canvas erbij en noteer jouw gekozen focus in het bovenste invulvak. De medeontwerper herformuleert dit als een "Waarom-vraag" en schrijft deze op

het canvas. Bijvoorbeeld: als de focus is "Ik wil een betere ontwerper worden", stelt de medeontwerper de vraag: "Waarom wil je een betere ontwerper worden?". De hoofdontwerper schrijft het antwoord op het canvas. Herhaal dit nog vier keer. Het laatste antwoord is de verfijnde versie van de focus. Herformuleer dit tot een "Hoe kunnen we...?" vraag, schrijf dit op een kaartje en bewaar deze in de display hieronder. Schrijf je belangrijkste conclusies of gedachten aan de buitenkant van de toolkit.

### Wat is "Mijn Focus?"

In deze fase bepaal je de richting van jouw ontwerproces. Je kiest een uitdaging waarvoor je iets wilt gaan ontwerpen. Je probeert ook beter te begrijpen waar deze uitdaging precies over gaat. Op die manier kom je tot de kern van de uitdaging en wordt het makkelijker om er een goede oplossing voor te bedenken. De Mijn Focus-fase helpt je hier mee. Aan het einde van deze fase weet je beter waarvoor en waarom je iets wilt gaan ontwerpen.



### Wat doet de medeontwerper?

Kan de hoofdontwerper helpen met formuleren. Formuleert de focus en de antwoorden als "waarom...?"-vragen. Let hierbij op de deze vragen steeds een verfijning zijn op het oorspronkelijke ontwerp. Mag niets op de canvassen schrijven zonder toestemming van de hoofdontwerper. Mag geen antwoorden geven op de Waarom-vragen voorzeggen voor de hoofdontwerper. Voorbeelden geven mag wel.

## Mijn Situatie

### Eigenschappen van Dingen:

Haal de sorteerkarten uit de stapel met eigenschappen en leg deze op de tafel.

- Dit vind ik fijn.
- Dit vind ik oké.
- Dit vind ik niet fijn.

Bekijk de overige kaarten. Deze zijn opgedeeld in zes categorieën:

- Zien
- Ruiken
- Horen
- Gebruiken
- Voelen
- Stijl

### Uitvoeren:

Sorteer alle kaarten in de drie groepen. Je bedenkt bij elke kaart of je het fijn zou vinden als jouw oplossing deze eigenschap heeft. Ga door tot alle kaarten gesorteerd zijn.

Kies de kaartjes in de categorie "vind ik fijn" die jij het belangrijkste vindt en bewaar "fijn" die jij het belangrijkste vindt en bewaar deze in de display hieronder. Schrijf je belangrijkste conclusies of gedachten aan de buitenkant van de toolkit.

### Wat doet de medeontwerper?

Helpt de hoofdontwerper door voorbeelden te geven van dingen die de eigenschappen hebben die op de kaart staan. Helpt de hoofdontwerper door in de eigen omgeving voorbeelden van de gegeven eigenschappen te vinden. Mag niet zonder toestemming van de hoofdontwerper kaartjes invullen of sorteren.

### Wat is "Mijn Situatie?"

In deze fase leg je vast hoe jouw dagelijks leven eruit ziet, en welke rol technologie hier nu al in speelt.

Het is goed om te weten dat je in de Mijn Situatie-fase nog niet echt gaat ontwerpen, al is het wel een belangrijk startpunt. Aan het einde van de deze fase heb je namelijk een beter idee waar jouw oplossing aan moet voldoen, en hoe en waar deze het best kan worden ingezet.

De inzichten uit de Mijn Situatie-fase vormt de basis voor de rest van je ontwerproces.



## Digitale Tools

### Denk Vertel Herken

Kom erachter hoe jij in jouw dagelijks leven al technologie gebruikt.



### Uitdagingen en Strategieën

Beschrijf strategieën die je al gebruikt om uitdagingen te overwinnen.



### Mijn Omgeving

Onderzoek jouw routines aan de hand van een plattegrond van jouw omgeving.



### Mijn Routine

Beschrijf gedurende een dag hoe je je voelt, en ontdek waar je in jouw omgeving jij iets wilt veranderen.



### Mijn Dag

Houd een logboek bij van jouw dag. Kom achter jouw waardigheden, en uitdagingen die je nog wilt overkomen.



**Design Your life**

in situat  
nschappen  
dingen

## A4: Ethical Review testing

The Ethical review is performed by the BMS faculty ethical committee at the University of Twente.

**UNIVERSITY OF TWENTE.**

FACULTY BMS

### 231484 REQUEST FOR ETHICAL REVIEW

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Request nr: 231484  
Researcher: Duijn, M.C. van  
Supervisor: Dijk, J. van  
Reviewer: Vries, P.W. de  
Status: Approved by commission  
Version: 2

#### 1. START

##### A. TITLE AND CONTEXT OF THE RESEARCH PROJECT

1. What is the title of the research project? (max. 100 characters)

Designing a toolkit for people with autism wanting to design their own tools

2. In which context will you conduct this research?

Master's Thesis

3. Date of the application

19-12-2023

5. Is this research project closely connected to a research project previously assessed by the BMS Ethics Committee?

Yes

please provide the ethic request number(s) for the research project(s):

2020.44

##### B. CONTACT INFORMATION

6. Contact information for the lead researcher

6a. Initials:

M.C.

6b. Surname:

van Duijn

6c. Education/Department (if applicable):

M-IDE

6d. Staff or Student number:

1829378

6e. Email address:

[REDACTED]

6f. Telephone number (during the research project):

[REDACTED]

6g. If additional researchers (students and/or staff) will be involved in carrying out this research, please name them:

-

6h. Have you completed a PhD degree?

No

7. Contact information for the BMS Supervisor

7a. Initials:

J.

7b. Surname:

van Dijk

7c. Department:

ET-HCD

7d. Email address:

[REDACTED]

7e. Telephone number (during the research project):

[REDACTED]

8. Is one of the ethics committee reviewers involved in your research? Note: not everyone is a reviewer.

No

C. RESEARCH PROJECT DESCRIPTION

9a. Please provide a brief description (150 words max.) of the background and aim(s) of your research project in non-expert language.

Design Your Life (DYL) is an ongoing project at the University of Twente, focusing on developing a toolkit to help young people with autism in designing their own tools to assist them in daily life. For my master thesis, I am involved with this ongoing project, and I am tasked with redesigning the physical form of the toolkit. The research goal is to determine how physical form-giving can contribute to creative sensemaking, using DYL as a case study. The prototype of the final design is to be evaluated with and by young adults with autism.

9b. Approximate starting date/end date of data collection:

Starting date: 2024-01-07

End date: 2024-01-08

9c. If applicable: indicate which external organization(s) has/have commissioned and/or provided funding for your research.

Commissioning organization(s):

2024-01-08 17:37:42

2/6



Not applicable

Funding organization(s):

Not applicable

## 2. TYPE OF STUDY

Please select the type of study you plan to conduct:

I will be collecting new data from individuals acting as respondents, interviewees, participants or informants.

## 4. RESEARCH INVOLVING THE COLLECTION OF NEW DATA

### A: RESEARCH POPULATION

20. Please provide a brief description of the intended research population(s):

The intended research population exists of two young adults (students) with autism.

21. How many individuals will be involved in your research?

Two.

22. Which characteristics must participants/sources possess in order to be included in your research?

Must be a young adult (~18 to 28) with autism.

23. Does this research specifically target minors (<16 years), people with cognitive impairments, people under institutional care (e.g. hospitals, nursing homes, prisons), specific ethnic groups, people in another country or any other special group that may be more vulnerable than the general population?

No

24. Are you planning to recruit participants for your research through the BMS test subject pool, SONA

No

### B. METHODS OF DATA COLLECTION

25. What is the best description of your research?

- Interview research

26. Please provide a brief yet sufficiently detailed overview of activities, as you would in the Procedure section of your thesis or paper. Among other things, please provide information about the information given to your research population, the manipulations (if applicable), the measures you use (at construct level), etc. in a way that is understandable for a relative lay person.

The participant will be presented with a final prototype of the redesigned (fully functional) toolkit. They will be given background information on what the toolkit is, and in which situation a person might find themselves using the toolkit. They are informed that they are part of the target group demographic, and that their purpose in this interview is to provide insight and answer questions from the point of view of a potential user (young adult with autism, that is so far unfamiliar with the toolkit; unbiased). They will be allowed to explore the toolkit on their own accord. The participant will have the opportunity to freely give their first impressions. Then, the

researcher will ask the participant questions relating to the toolkit. These questions are informed by the points of improvement that the toolkit is designed to target. Following this first round of questions, the participant is also presented with the current (original DYL) toolkit. The questions from the first round are then discussed again, particularly regarding how the redesigned toolkit did or did not improve upon the intended points of improvement.

How much time will each participant spend (mention the number of sessions/meetings in which they will participate and the time per session/meeting)?

20 to 30 minutes, one session

#### C: BURDEN AND RISKS OF PARTICIPATION

27. Please provide a brief description of these burdens and/or risks and how you plan to minimize them:

Before agreeing to participate, the participant will be informed that autism, and the way it affects their sensemaking in life, will be discussed during the interview. The user is informed beforehand that if they find themselves unwilling to further discuss or elaborate on any answers given, or even stop the interview, that they may do so.

28. Can the participants benefit from the research and/or their participation in any way?

Yes

Please Explain:

DYL as a project is reaching its end and will have a symposium up in spring 2024, with a potential to produce multiple toolkits and bring them to the UT and/or the market. The participant, a young adult with autism, may soon have access to a fully finalized toolkit that they are the target demographic for. In giving their feedback and helping with this part of the research, they can contribute to a project that they might find themselves using one day.

29. Will the study expose the researcher to any risks (e.g. when collecting data in potentially dangerous environments or through dangerous activities, when dealing with sensitive or distressing topics, or when working in a setting that may pose 'lone worker' risks)?

No

#### D. INFORMED CONSENT

30. Will you inform potential research participants (and/or their legal representative(s), in case of non-competent participants) about the aims, activities, burdens and risks of the research before they decide whether to take part in the research?

Yes

Briefly clarify how:

The purpose of the interview is completely transparent, as it is paramount that the user fully understand the situation in which a person might want to use the toolkit, and what user group the toolkit

is meant for. Before the interview, they will receive a form that briefly outlines the DYL research, its purpose, and what the interviews are meant to achieve. This is repeated during the interview.

32. How will you obtain the voluntary, informed consent of the research participants (or their legal representatives in case of non-competent participants)?

Signed

33. Will you clearly inform research participants that they can withdraw from the research at any time without explanation/justification?

Yes

34. Are the research participants somehow dependent on or in a subordinate position to the researcher(s) (e.g. students or relatives)?

No

35. Will participants receive any rewards, incentives or payments for participating in the research?

- No

36. In the interest of transparency, it is a good practice to inform participants about what will happen after their participation is completed. How will you inform participants about what will happen after their participation is concluded?

- Participants will receive the researcher's contact details, so that they can contact the researcher if they have questions/would like to know more.
- Participants will receive oral/written information about what the researcher(s) will do with the collected data.

#### E. CONFIDENTIALITY AND ANONYMITY

37. Does the data collected contain personal identifiable information that can be traced back to specific individuals/organizations?

No

39. Will you make use of audio or video recording?

No

#### 5. DATA MANAGEMENT

- I have read the UT Data policy.
- I am aware of my responsibilities for the proper handling of data, regarding working with personal data, storage of data, sharing and presentation/publication of data.

#### 6. OTHER POTENTIAL ETHICAL ISSUES/CONFLICTS OF INTEREST

40. Do you anticipate any other ethical issues/conflicts of interest in your research project that have not been previously noted in this application? Please state any issues and explain how you propose to deal with them. Additionally, if known indicate the purpose your results have (i.e. the results are used for e.g. policy, management, strategic or societal purposes).

/

## 7. ATTACHMENTS

-

## 8. COMMENTS

-

## 9. CONCLUSION

Status: Approved by commission

The BMS ethical committee / Domain Humanities & Social Sciences has assessed the ethical aspects of your research project. On the basis of the information you provided, the committee does not have any ethical concerns regarding this research project. It is your responsibility to ensure that the research is carried out in line with the information provided in the application you submitted for ethical review. If you make changes to the proposal that affect the approach to research on humans, you must resubmit the changed project or grant agreement to the ethical committee with these changes highlighted.

Moreover, novel ethical issues may emerge while carrying out your research. It is important that you reconsider and discuss the ethical aspects and implications of your research regularly, and that you proceed as a responsible scientist.

Finally, your research is subject to regulations such as the EU General Data Protection Regulation (GDPR), the Code of Conduct for the use of personal data in Scientific Research by VSNU (the Association of Universities in the Netherlands), further codes of conduct that are applicable in your field, and the obligation to report a security incident (data breach or otherwise) at the UT.

## A5: Testing consent forms

**Project title:** Toolkit for People with Autism

**Researcher:** Mika van Duijn (m.c.vanduijn@student.utwente.nl)

**Research setting:** Master thesis

**Date:** 07-01-2024

### Informed Consent form

The participant is asked to participate in an evaluation of a physical prototype. This prototype is a result on attempting to improve upon the existing Design Your Life (DYL) toolkit. This toolkit helps guide young adults with autism through a design process from start to finish, with the distinct purpose of facilitating the user to develop their own personal tool. This tool could be a stress ball, an agenda, a noise machine, or something different entirely. The toolkit has the user go through 6 phases of a design process, where the user learns about themselves, their needs and preferences, as well as developing and reflecting on their own tool.

*I hereby declare that I have been informed in a manner which is clear to me about the nature and method of the research. I will participate in a testing session in which I will evaluate a physical prototype. My questions have been answered to my satisfaction. I agree of my own free will to participate in this research.*

*I reserve the right to withdraw this consent without the need to give any reason and I am aware that I may withdraw from the research study at any time. If my research results are to be used in scientific publications or made public in any other manner, then they will be made completely anonymous. My personal data will not be disclosed to third parties without my expressed permission. If I request further information about the research, now or in the future, I may contact Mika van Duijn at [m.c.vanduijn@student.utwente.nl](mailto:m.c.vanduijn@student.utwente.nl) or [mika.vanduijn@gmail.com](mailto:mika.vanduijn@gmail.com).*

Signed:

Participant

Signature:

*I have provided explanatory notes about the research. I declare myself willing to answer to the best of my ability any questions which may still arise about the research.'*

Mika van Duijn

Signature:

## A6: Complete testing answers

*(Note: Answers are freely translated from Dutch to English)*

1. Inform the participant about the DYL project and its purpose. Inform them that their perspective as YAWA can help me reflect on the effectiveness of the design choices present in the prototype.
2. Show the participant the prototype. They are asked to use it and explore it, but are not informed about the reasoning behind the design choices. Gather their initial impressions.

*“I think it’s a really nice prototype. I like that the doors have the holes in it, but they are not intuitive to open. It doesn’t have a handle and it doesn’t stay closed when you turn the toolkit around. The handle on top is a bit too small. The colours are nice and I like that the arrow tells you where to go. I like that it’s kind of heavy and robust. The QR codes are a fun idea.*

3. Inform the participant about why the prototype looks the way it does. Explain the rationale behind the design choices. Gather their perspective on those rationales; whether they agree, what they would change, the degree of effectiveness, etc.

*“The whole showing the conclusions part is a good idea and I think it works. But I would personally want to have stickers to put on the outside, so you can put another one over the old conclusion if it changes. Just writing on the outside door seems so definitive that I would probably never write something on it. Putting the cards in the doors works well though. I also like how when you haven’t worked with the toolkit yet, that you can look inside, but once you’re done, you can’t anymore. The colours seem fine to me. (About the kits opening sideways rather than from above) I don’t think it matters much. If I’m using the toolkit I would probably take it out (of the base) anyway, so it doesn’t matter that I can’t see the other two. I would just put the other two away when I work with one.”*

4. Show the participant the current DYL toolkit. Again, they are asked to use and explore it. Ask the participant to reflect on the answers given in phase 2 and 3, now knowing how the prototype changes the physical experience. Which changes work, which don’t, would they change anything themselves, etc.

*“I think it’s generally a big upgrade. The plastic makes it feel more like an actual toolkit instead of the cardboard. It’s also much easier to know how to start. When you open the box, everything is kind of disorganized and I wouldn’t know where to start. (After telling her to start with the bundle) I wish it showed that. This is very thick. (After browsing the bundle) In here it does explain the project at least. But I do like how your prototype doesn’t have so many different things. This looks like a board game with cards. (After explaining that the playing boards purpose, and that in the prototype it is integrated into the kit) Why would you ever use the board if you’re using the cards. I would just save the cards in a separate stack and write my conclusions in like a notebook or something. It’s too big and unwieldy. (After asking what she thinks about the changes present in the prototype) This is more logical. You don’t need a board. But I also think the instructions should also be on a separate paper or card. Not just on the door. It’s difficult to read*

*because it's so small. (After explaining that it integrates role 1 of the ES framework) I still want it separate."*

1. Inform the participant about the DYL project and its purpose. Inform them that their perspective as YAWA can help me reflect on the effectiveness of the design choices present in the prototype.
2. Show the participant the prototype. They are asked to use it and explore it, but are not informed about the reasoning behind the design choices. Gather their initial impressions.

*"It looks good. If it were for real I think the stickers should be painted or laser printed on. The stickers make it look a bit cheap. It's nice that you can carry it. I like that the colours show that it has two parts. The windows are cool. (Participant asked about the back of the kit. After showing that it can be plugged into the middle piece, along with the other two kits) It looks really nice altogether. How heavy is it?"*

3. Inform the participant about why the prototype looks the way it does. Explain the rationale behind the design choices. Gather their perspective on those rationales; whether they agree, what they would change, the degree of effectiveness, etc.

*"It sounds logical. The idea that you only see the content if you open the doors, I like that. But you can still see inside a bit. It's good that it's compact. You can see all you need to do, and nothing more than that. Putting a card on display is a good idea, but it feels double with the conclusions on the front as well. You could just write the conclusions on the cards. But there might not be enough room. (After asking about the colours) I like the colour palette. It's not too 'wow, in your face'. It also says that everything green is part of the first part, and everything yellow is the second part. (About the kits opening sideways) I like it, but it makes it hard to read from the doors. But it's not just opening a box. I think it's good. I would make it a bit deeper. It's too flat."*

4. Show the participant the current DYL toolkit. Again, they are asked to use and explore it. Ask the participant to reflect on the answers given in phase 2 and 3, now knowing how the prototype changes the physical experience. Which changes work, which don't, would they change anything themselves, etc.

*"It looks more like an actual thing you can buy from the store or something. (Referring to the current toolkit) This is also much bigger. (After explaining that the toolkit is now divided into 3, and that many tools are now digital) It's better. Yours shows what to start with. This one has too many things. I also don't like that all the cards are just thrown into the box. (After*

*asking how it compares to the prototype) It's more organized. Everything has its spot. (After asking about the bundle vs incorporating the bundle into the toolkit) It's good that you show only the relevant stuff. But why don't you have a bundle in the prototype? (After explaining about the framework, role 1) I think it should still be a separate thing. I understand what you're doing, but I don't think it work in practice.*