# Designing a neuroatypical weather-based planning tool

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# Abstract

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People with Asperger's Syndrome have been reported to perform significantly below average a composite measure of executive functioning. Particularly, the syndrome has been characterized by difficulties with flexible switching of attention and planning.

The methods and tools designed to aid these matters have been traditionally shaped after the medical model of Asperger's Syndrome, which has been restricted to impairment-based theories and generalizations.

This thesis project uses Research through Design and Autoethnography as methodologies to find representative ways in which digital artifacts can be designed to aid planning for people with Asperger's Syndrome.

The resulting prototype of this project is a personal weather-based planning tool, which explores my relationship as a person with Asperger's Syndrome to hyper-systematization types, hyper-sensibility to weather, and planning.

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# 1 Introduction

The emergence of active neurodiversity advocate groups have sparked discussions about the adequacy of the definitions and treatments of marginalized neurological groups.

Asperger's Syndrome (AS), in particular, had a history of reframing and redefining until being finally absorbed by the Autism Spectrum Disorder (ASD) in the DSM-5 (Association, 2013a) . The medical model of typically described AS as repetitive in behaviours and interests (Turner, 1997), with diverse theories venturing explanations to why this is.

While the efforts of the neurodiversity movements try to shift the views and definitions to acceptance and validation, the current challenges the ASC community face with employment are notorious.

The autistic community, which Asperger's Syndrome is part of, has the lowest rate of employment across disabilities. A US report done in 2015 shows that only 58% have worked during their early 20s. Nearly 80% worked part-time and earned an average of $9.11 per hour. Full-time workers earned an average of $8.08 per hour (Roux et al., 2015). Alarmingly unemployed and underemployed.

In my personal experience, being recently diagnosed with Asperger's Syndrome, I have been able to maintain myself working by being a freelancer and finding the methods and strategies that minimize the exhaustion and harmful effects of 'camouflaging'.

Camouflaging refers to strategies used to compensate for or mask autistic characteristics during social interactions. Typical examples of these are forcing oneself to make eye contact during a conversation, or using working memory strategies to develop a list of appropriate topics for conversation (Hull et al., 2017). The consequences of camouflaging have been reported to be mentally, physically, and emotionally draining, by requiring intense concentration, self-control, and man-agement of discomfort. These actions, often result in extreme anxiety and stress, and the necessity to withdraw from social interactions to be able to rest (Hull et al., 2017).

Camouflaging affects my ability to work. Not only because of the energy required to coordinate socially in a team, but also the implicit given that my methods and process need to align with the neurotypical standard. My efforts to comply are at best a mediocre display of my skills attempting to attenuate social conflicts. The purpose of this thesis is to find appropriate ways in which technology can support people with Asperger's Syndrome to plan their work in their terms, subscribing to their methods. And employ these insights to design a personal tool which facilitates the planning process I use in my practice.

To do so, I follow the research question:

*How can we design a planning tool for people with Asperger's Syndrome?*

Which requires clarification and characterization of Asperger's Syndrome, inquiry on their methods of planning, and an analysis of design approaches that can provide adequate answers to this challenge.

This document is divided into six chapters. Chapter 2 presents the current context of neurodiversity movements and their claims, a historical review of Asperger's Syn-drome describing hyper-systemization, and a definition of cognitive planning as an executive function. Chapter 3 reviews the current landscape of tools designed with similar objectives in three categories: Visual Planning Tools, Data Visualization Inter-faces and Informative Art. Chapter 4 introduces Autoethnography, its data collecting and reflective methods, and Research Through Design, as a research approach of in-quiry employing a design process, as the two primary methodologies adopted and their relevance for this research project. Chapter 5 describes the conceptualization and iterative prototyping process supporting the design of the artifact. Chapter 6 considers the limitations, possible future research and conclusions.

# 2 Literature Review

This chapter starts by presenting an overview of the current notions of neurodiversity in contrast to the medical model of disability. It proceeds with a chronological review of the history and definitions of Asperger's Syndrome. To finalize with a non-impaired, talent-based characterization of the Autism Spectrum Condition, exploring its hyper-systemizing and sensory hypersensitivity traits.

## 2.1 Neurodiversity Movement

The neurodiversity movements align with the perspective that "autism is a natural human variation that should be accepted and respected as 'a different way of un-derstanding the world'" (Todd, 2013, p. 25). This movement recognizes the diversity of the human brain and the variation of neurocognitive functioning within humans (Walker, 2014). Not only for autism but for other neurological conditions for example dyslexia or ADHD.

Based on the perception of self-advocate autistics and the neurodiversity movement, a cognitive difference is not considered as a deficiency, based on the understanding that disability is a social construct (Loftis, 2015). As such, the neurodiversity move-ment call for the argument that autism should be protected by law as they were to be minority groups rather than disability. (Loftis, 2015). Parents of children with autism have argued that the common medical model sug-gested by doctors and therapists focus on the attempt to cure autism (Kapp et al., 2013). The Neurodiversity Movement, address to that

matter, claiming that the search for therapies to be intolerant of difference (Ortega, 2009, p. 60), as society addresses the non-autistic people as the norm that people with autism should fit into. Moreover, the movement "opposes interventions that eliminate unusual but harmless behaviours, such as sensory seeking, without regard for the coping mech-anisms they serve" (Kapp et al., 2013, p. 60).

In February of 2019, a team of neurodivergent United Kingdom's Labour Party mem-bers and supporters assembled by John McDonnell launched the Labour Manifesto on Autism/Neurodiversity. The manifesto describes principles, the current situation and policies to challenge discrimination and inequality. A copy of the manifesto can be found in Appendix E.

There is a debate even within the movement and from the autistic community about whether this paradigm is reasonable or more specifically where to draw the line. Many socially impaired or non-verbal people with autism require aid, and the move-ment's views have been criticized to only be applicable to "high functioning" people on the spectrum.

I acknowledge the reality that everyone in the spectrum is diferent and has different needs, and that there can't be a universal solution to aid autism as a whole. With the optimism of my privileged position, I am focusing on the scope of this project in my personal situation. That is of a person with ASD level 1 (Asperger's Syndrome) exploring the validity of the neurodiversity movement claims.

### 2.1.1 Asperger's Syndrome

Autism Spectrum Disorders are characterized by atypical communication and social development. Restricted, repetitive, and stereotyped patterns of behaviour are also key features of the disorder and are thought to reflect a failure of inhibition, cognitive rigidity, and a generativity impairment (Turner, 1997). Asperger's Syndrome (AS) was initially described in 1944 by Hans Asperger (As-perger, 1944) and has been controversial ever since. Asperger's work has been linked to the Nazi eugenics program (Czech, 2018).

In the scientific community, there has been a constant debate about considering it a different condition than autism. While the fourth edition of the Diagnostic and Sta-tistical Manual of Mental Disorders (DSM-IV) (Association, 1994) considered AS as a separate diagnosis, the DSM-5 Manual (Association, 2013b) has included Asperger's Syndrome as part of the Autism Spectrum Disorder. Specifically the diagnostic cat-egory of "Autism Spectrum Disorder Level 1, without accompanying intellectual or language impairment"[p.53]. Opposing views confront the term "spectrum" as it refers to values of a variable dis-tributed along a single dimension, wrongly suggesting that people can be ranked as less or more "autistic" (Greenspan, 2018). And the term "disorder" is often replaced with "condition".

The term Asperger's is still used while referring to ASD Level 1 as it is often understood by the general public (Attwood, 2006). The AS community may use ASC, Asperger's or "Aspie" to refer to its members.

#### 2.1.1.1 Hyper-systemizing

In his article, Talent in autism: hyper-systemizing, hyper-attention to detail and sen-sory hypersensitivity, Baron-Cohen et al. (Baron-Cohen et al., 2009) claim that savantism, defined as a prodigious talent, is a subgroup of people with autism spectrum conditions (ASC). Savantism is found more commonly among ASC groups than in any other neurological groups (Howlin et al., 2009), and the majority of those with savantism have an ASC (Hermelin, 2001).

A more universal feature of the autistic brain is excellent attention to detail (Shah and Frith, 1993) (Jolliffe and Baron-Cohen, 1997) (O'riordan et al., 2001). Baron-Cohen et al. argue that excellent attention to detail exists in ASC because of evolution-ary forces positively selecting brains for strong systemizing, a highly adaptive human ability (Baron-Cohen et al., 2009).

When considering the kinds of domains in which savants typically excel, it is those domains that are highly systemizable. According to Baron-Cohen et al., strong sys-temizing requires excellent attention to detail, and in their view, the latter is in the service of the former. Attention occurs at an early level of cognition, while systemizing is a fairly high-level aspect of cognition (Baron-Cohen et al., 2009). Strong systemizing is a way of explaining the non-social features of autism: narrow interests; repetitive behaviour; and resistance to change/need for sameness. This is because when one systemizes, it is best to keep everything constant, and to only vary one thing at a time (Baron-Cohen et al., 2009).

**Types of Systems**

Talent in autism comes in many forms, but a common characteristic is that the indi-vidual becomes an expert in recognizing repeating patterns in stimuli. (Baron-Cohen et al., 2009) call this systemizing, defined as the drive to analyze or construct systems. These might be any kind of system. What defines a system is that it follows rules, and when we systemize we are trying to identify the rules that govern the system, in order to predict how that system will behave (Baron-Cohen, 2006). These are some of the major kinds of system:

Box 1. Systemizing in classic autism and/or Asperger's syndrome.

| type of systemizing | classic autism | Asperger's syndrome |
|---|---|---|
| sensory systemizing | tapping surfaces or letting sand run through one's fingers | insisting on the same foods each day |
| motoric systemizing | spinning round and round, or rocking back and forth | learning knitting patterns or a tennis technique |
| collectible systemizing | collecting leaves or football stickers | making lists and catalogues |
| numerical systemizing | obsessions with calendars or train timetables | solving maths problems |
| motion systemizing | watching washing machines spin round and round | analysing exactly when a specific event occurs in a repeating cycle |
| spatial systemizing | obsessions with routes | developing drawing techniques |
| environmental systemizing | insisting on toy bricks being lined up in an invariant order | insisting that nothing is moved from its usual position in the room |
| social systemizing | saying the first half of a phrase or sentence and waiting for the other person to complete it | insisting on playing the same game whenever a child comes to play |
| natural systemizing | asking over and over again what the weather will be today | learning the Latin names of every plant and their optimal growing conditions |
| mechanical systemizing | learning to operate the VCR | fixing bicycles or taking apart gadgets and reassembling them |
| vocal/auditory/verbal systemizing | echoing sounds | collecting words and word meanings |
| systemizing action sequences | watching the same video over and over again | analysing dance techniques |

Figure 1: Systemizing in classic autism and/or Asperger's syndrome, Baron-Cohen et al. 2008.

#### 2.1.1.2 Sensory Hypersensitivity

In their article, Making sense of it all: The impact of sensory processing sensitivity on daily functioning of children, Boterberg Sofie and Warreyn Petra (2016), cite Aron and Aron (1997) definition for Sensory Processing Sensitivity (SPS), or in its more common term "hypersensitivity" and "highly sensitive", describing it as a "genetically determined temperamental or personality trait which is present in some individuals and reflects an increased sensitivity of the central nervous system and a deeper cognitive processing of physical, social and emotional stimuli" (Boterberg and Warreyn, 2016, p. 80).

Baron-Cohen et al. (2009) argue that one can trace excellent attention to detail to its basis in sensory hypersensitivity in autism spectrum conditions (ASC). Rather than assuming that the strong systemizing in ASC is ultimately reducible to excellent at-tention to detail, they pursue the idea that the excellent attention to detail is itself reducible to sensory hypersensitivity (Mottron and Burack, 2001) postulated the 'en-hanced perceptual functioning' model of ASC, characterized by superior low-level perceptual processing.

In their attempt to answer the question "to what extent is this a feature of basic sensory physiology?" Baron-Cohen et al. (p.1380, 2009) reviewed several case studies which have proven that greater sensory perception in ASC across multiple modalities.

## 2.2 Planning as an Executive Function

'Executive function' is traditionally used as an umbrella term for functions such as planning, working memory, impulse control, inhibition, and shifting set, as well as the initiation and monitoring of action (Rabbitt, 2004) (Roberts, Robbins, and Weiskrantz, 1998). Executive functions (EFs) helps with staying focused by taking the time to think before acting (Diamond, 2013). That gives tools for the individual to respond flexibly and in reasonable response time to changed circumstances. For example, to predict challenging events, resist temptations, selective attention, cognitive flexibility, and seeing things from a different perspective. (Diamond, 2013)

**Cognitive Planning**

A central characteristic of most aspects of complex behaviour is the ability to plan. This is a fundamental requirement of many tasks involving cognitive and motor skills. Cognitive planning is required when sequences of responses must be generated and scheduled and when novel courses of action must be formulated and carried out (Owen, 1997).

Although adolescents with ASD have been reported to perform significantly below average a composite measure of executive functioning over and above their seem-ingly intact fundamental cognitive skills (Kleinhans, Akshoomoff, and Delis, 2005). Baron-cohen et al. restrain from endorsing the executive dysfunction theory (ED).

The ED theory (Rumsey and Hamburger, 1988)(Ozonoff, Pennington, and Rogers, 1991)(Russell, 1997) is the other major theory that has attempted to explain the non-social features of ASC, and particularly the repetitive behaviour and narrow in-terests that characterize ASC.

According to the executive dysfunction theory, impaired aspects of executive func-tion lead to perseveration if they are involved in flexible switching of attention and planning. The theory has difficulty in explaining a good understanding of a whole system. A good example might be a calendrical calculation, well-structured system, in which attention is adjustable. Although the ED theory also predicts perseveration (often noted as 'obsessions') it does not explain why in autism and Asperger's syndrome these should centre on systems (Baron-Cohen and Wheelwright, 1999). The ED theory "simply re-describes repetitive behaviour as an instance of ED with-out seeing what might be positive about the behaviour" (Baron-Cohen et al., 2009, p. 1380).

## 2.3 Summary

The discussions on neurodiversity movements provide guidelines for the design of an artefact that represent neuroatypical voices, rejecting "fixing" approaches and ableist definitions. The mandate "nothing about us without us" of the Labour Party's Mani-festo further develops this point, making it a requirement for the neurological group to be involved in every stage of this design process. From the review of the hyper-systemizing theory, I have come to the understanding that impaired-based definitions of autism have been confronted even from within the scientific community. These discussions provide initial ground towards a tal-ent/trait characterization of ASC, and on a more specific level, present foundational support to reframe executive dysfunction from within a neurodiversity approach.

Following these conclusions, I find it essential to adopt the user's approach to plan-ning and place the artefact within the user's domain of interactions. Moreover, hyper-systematization types contribute to the exploration of this domain by providing an open way of profiling from which the designer can learn about the user.

# 3 Contextual Review

This chapter reviews the current landscape of relevant tools available categorizing them into Visual Planning Tools, Data Visualization Interfaces and Informative Art. First, it presents an overview of what each category represents, followed by examples of related projects that act as a baseline from where to ideate possible solutions and exhibit the inadequacy of these tools considering the neurodiversity principles.

## 3.1 Visual Planning Tools

### 3.1.1 Overview

Evidence from a study of the behaviour of people with Asperger's has indicated that the use of a visual schedule has been the key to increasing its independence and managing its anxiety (Mesibov, Browder, and Kirkland, 2002) (Massey and Wheeler, 2000) (Bryan and Gast, 2000).

Despite these advantages, setting a visual schedule can seem like a daunting task that requires attention to its preparation and flexibility of thought. Especially among mature population where schedule changes are high or with hypersensible people that are greatly affected by weather conditions.

In the market, there is a variety of visual aids that assist in daily planning for people on the spectrum. They range from paper-based methods (post-it, diary, a sheet of paper), applications, sites that help to design a visual schedule, to products that physically inform of weather parameters, hours of the day or time left on a counter.

### 3.1.2 Related Projects


Figure 2: Children with Autism: A visual schedule, Enuma, Inc.

Visual Schedule is a mobile and wearable picture-based scheduler designed with the intention of empowering children and adults in the spectrum. Its presents a progression timeline with picture-based icons to represent different activities. With an accessible design it aims to build deeper understanding of time management and help users follow daily routines.


Figure 3: Choiceworks, App Store screenshots.

The Choiceworks mobile app is a learning tool that helps children complete daily rou-tines divided in morning, day, and night. It provides a picture-based task list among other auxiliary functionalities as the "feeling board", designed to understand, express and cope with emotions. It’s explicitly designed for caregivers to provide support to foster a child’s independence.

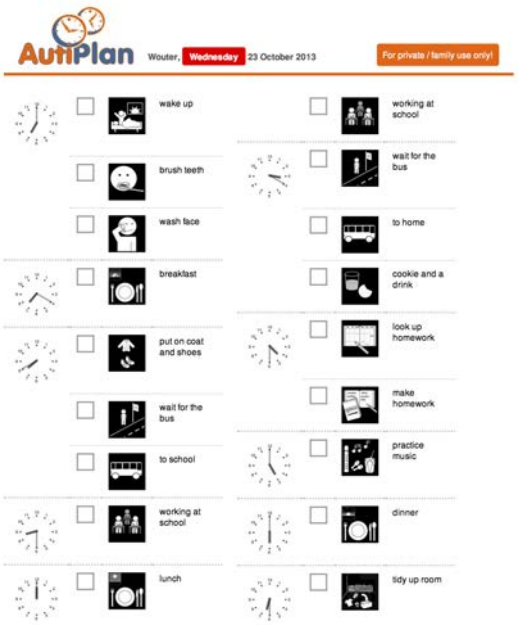


Figure 4: Autiplan, Example of a visual schedule.

AutiPlan is a practical aid tool, designed to provide a daily schedule of activities and tasks with clear visual representations. It aims to provide structure and predictabil-ity to reduce stress and anxiety for people on the spectrum. The schedule uses vi-sual (pictures and photos), text, speech, notifications and alarms. The app has been designed to simplify the process of creating a visual schedule by using automatic repetitions and templates.

## 3.2 Data Visualization Interfaces

### 3.2.1 Overview

In his book, Visualizing Data (2008) Ben Fry describes data visualization as a way to provide meaningful answers to questions, through the use of methods drawn "from the fields of computer science, statistics, data mining, graphic design, and visualization … that also makes the answers accessible to others". (Fry, 2008, p. 1). One of the challenges involved with Data visualization is that many times answering these questions involves large data and sometimes data that is constantly changing. As a data visualization practitioner, the goal is to highlight the main points, identify patterns and point the findings results from the intersection of multiple dimensions. (Fry, 2008, p. 1).

### 3.2.2 Related Projects

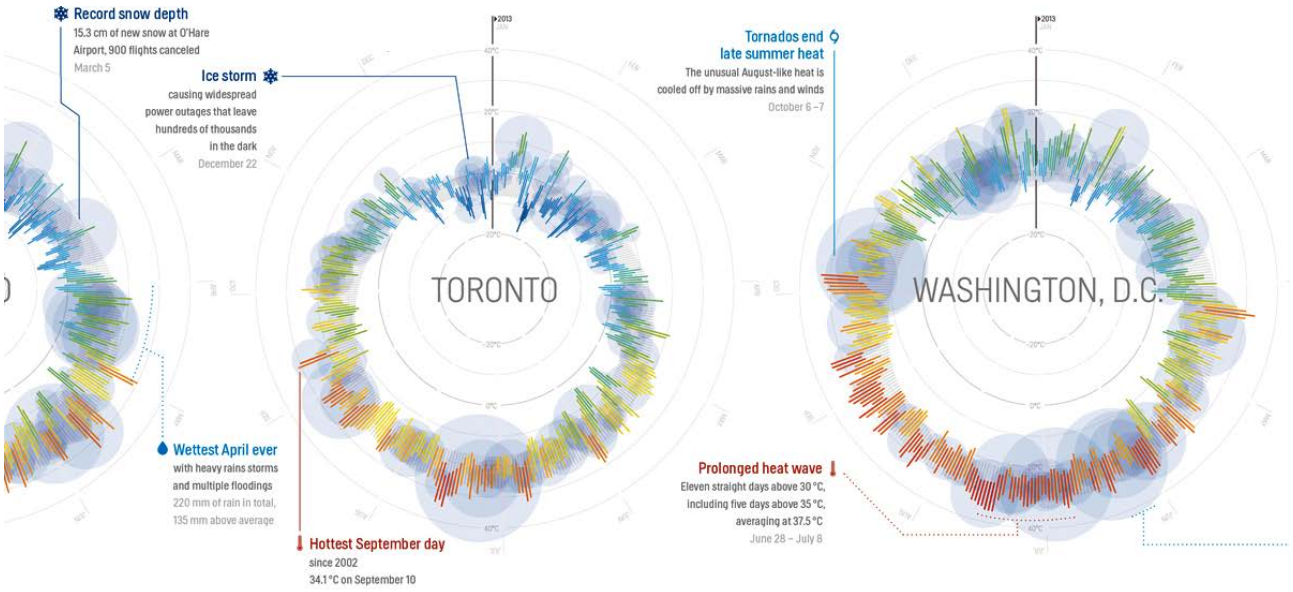


Figure 5: Weather Radials, 2013

The 2013 Weather Radials poster visualize the four seasons on a global scale. It is a collaboration between the German designer Timm Kekeritz of Raureif, and the entire Raureif team (Jana Kühl, Karen Hentschel, Tobias Ottenweller and managing partner Frank Rausch). Each Weather Radial demonstrate “the climatic characteristics of a place as well as that year’s particular local weather events.” The data presented combines extreme weather conditions, temperature, precipitation of rain or snow, and other meteorological events of 2013. The poster also designed as an iOS app.

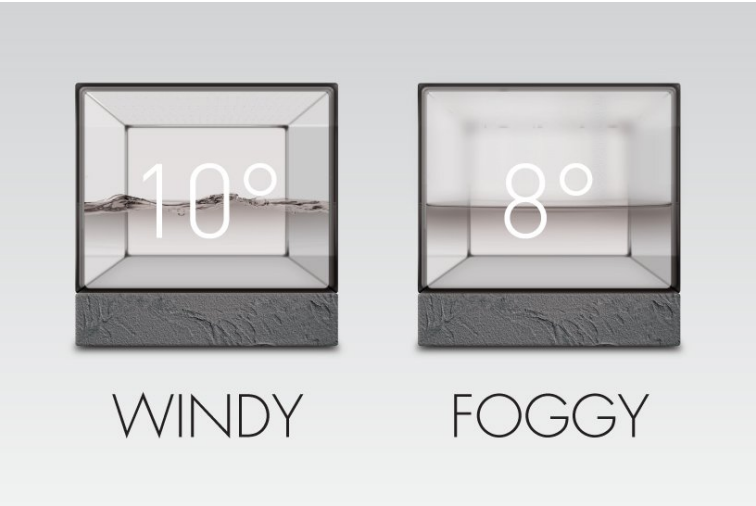


Figure 6: Weather Cube

Weather Cube is a product designed by Yu Zhuang and Hitomi Sato aiming to present weather phenomenons “like a snow ball”. Weather Cube shows the weather realistically by using water to create “a live weather scene”. It aims to transfer the experience of the user from reading the weather to feeling the weather.

Figure 7: Weather Systems

Weather Systems are forecasting IoT objects that subtly predict the weather in a specific location accurately to the minute. Weather Systems explores the potential to combine cloud-based weather data with physical devices, to create weather alerts for rain, temperature and wind. The devices are shared objects, and as such, they can be used by multiple people.

## 3.3 Informative Art

### 3.3.1 Overview

In their article Lars Erik Holmquist and Tobias Skog (2003) use Redstorm definition of Informative Art as "...a type of computer applications which borrow their appear-ance from well-known artistic styles to visualize dynamically updated information" (Redström, Skog, and Hallnäs, 2000, p. 103-114) (cited by Lars Erik Holmquist and Tobias Skog), while emphasizing the importance of the "decorative role of visual art" as a fundamental criteria. Informational Art might be based on data from a variety of sources such as available information of the internet, and local information perceived by the designer and processes through painterly rendering techniques (Holmquist and Skog, 2003). It uniqueness is embedded in its ability to enjoy "aesthetic sensi-bilities that an artist could provide" (Holmquist and Skog, 2003, p. 234), and provid-ing its users to "a continuously updated overview of a complex information source" (Holmquist and Skog, 2003, p. 234).

Informative Art has been influenced by the attempt of creating an artistic "graphical output . . . using computer algorithms.. [with the intent to] mimic the style of hu-man artists" (Holmquist and Skog, 2003, p. 230). It has grown out of the concept of ubiquitous computing where computing resources are distributed in the everyday environment rather than being confined to a desktop workstation (Weiser, 1991). Similar work can be identified in the concept of Calm Technology, developed to de-scribe the need to reduce information overload while considering the full range of attention (Weiser and Brown, 1995). Or in the concept of Ambient Media (Ishii and Ullmer, 1997), which is an information display designed to address the periphery of

the user's attention, and relying on "the human capability for "background process-ing" of information". (Holmquist and Skog, 2003, p. 230). However, Informative Art differs from these two concepts as it relies on "inspiration from both the appearance and the function of traditional art." (Holmquist and Skog, 2003, p. 230).

### 3.3.2 Related Projects

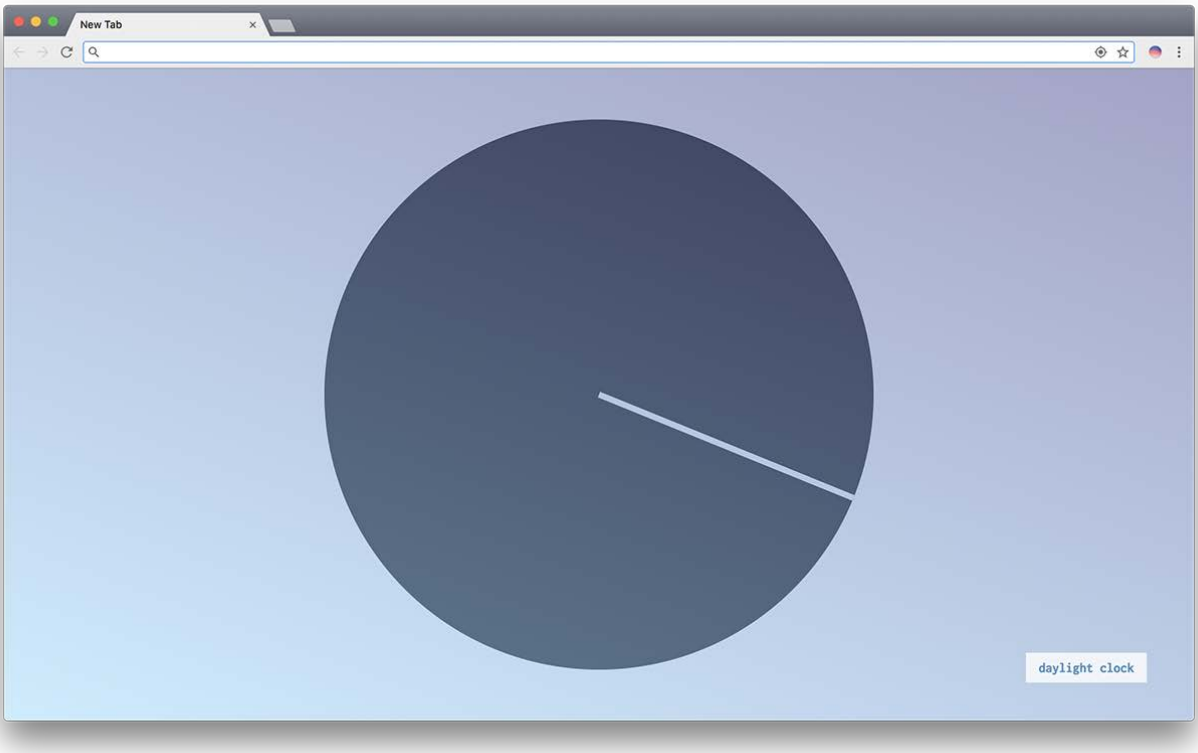


Figure 8: Digital version of The Daylight Clock, Arielle Hein, 2017

Arielle Hein describes her work in The Daylight Clock as "a dynamic expression of time based on the period of daylight for your current location" (Hein, 2017). It translates the course of daylight hours into a full rotation of the clock's hand. Hein designed two versions of the project. A web version that is available as a browser extension that displays the clock in new tabs. And a physical replica that is placed in the everyday environment (Hein, 2017).

Figure 9: Physical version of The Daylight Clock, Arielle Hein, 2017

Figure 10: In the Shadow of a Giant, Nathalie Miebach, 2013


Figure 11: The Singing Sailors of Sable Island, Nathalie Miebach, 2014

Nathalie Miebach's work focuses on "the intersection of art and science and the vi-sual articulation of scientific observations" (*Nathalie Miebach: sculpture*). She em-ploys methodologies and processes of both disciplines, to translate meteorological data into the three-dimensional space of woven sculptures. With the intention of exploring the "role visual aesthetics play in the translation and understanding of science information" (*Nathalie Miebach: sculpture*) and questioning the "bound-aries through which science data has been traditionally visually translated" (*Nathalie Miebach: sculpture*).

## 3.4 Summary

After reviewing the landscape of current applications, I found that the vast majority of tools represent the medical model of autism. The ones featured in this chapter, effectively provide visual tools that tend to affect the behaviour and energy level of people on the spectrum. However, I argue that their usability is not suitable for the end user of this study as they are oriented as tools to be handled by the user's family or caregivers rather than a tool that the end user would autonomously use. Or, just because they are focused on designing for a younger audience.

There is a lack of representation from autistic voices in the current landscape of tools and how these are designed. Therefore, I have come to the resolution that in order to design a representative tool that suits my needs as a member of the ASC commu-nity, I will need to develop a personal planning tool aligned with the neurodiversity discourse.

Examining informative art provided me with a context of practice from which to begin the ideation as an expressive process. It holds that the provision of complex information can be stylized from the aesthetic sensibilities of the artist. And traces the commonalities that informational art has with calm and ubiquitous technology, which can guide the visual aspect and interactions of the tool.

# 4 Methodologies

In order to answer my research question, and based on the findings in the literature and contextual review, I decided to employ research through design and au-toethnography as the main methologies for my research.

By having in mind the shortage of current design projects guided by neurodiversity principles, RtD allows me as a researcher to approach the design process iteratively and progressively.

Autoethnography supports this approach providing methods to gather data from personal experiences from which I can start to frame the ideation process.

## 4.1 Autoethnography

Autoethnography is a qualitative research method that “allows researchers to draw on their own experiences to understand a particular phenomenon or culture” (Méndez, 2013, p. 280) and can take the form of a poem, a narrative or a story. It’s used in the context of qualitative research that requires the investigation of phenomena through the experience and point of view of the individual participants (Creswell and Creswell, 1997) (Merriam, 2009). Personal narratives and experiences become valuable data for the researcher in which they can start to ‘find those tentative answers they are looking for (Marshall and Rossman, 1999)’(Méndez, 2013, p. 280). Mendez identifies three different types of autoethnography from the work of Ellis and Bochner (2000), and Maso (2001). First, as research about personal experiences of a research process. Second, as a parallel exploration of the researcher’s and the participants’ experiences.

And third about the experience of the researcher while conducting a specific piece of research. For my research I'm using the first and third approach to consider the significance of the process as both the researcher and the participant.

According to McIlveen the core feature of autoethnography involves the researcher performing narrative analysis "intimately related to a particular phenomenon" (McIl-veen, 2008, p. 3). Mendez recognizes that autoethnography "... is not just writing about oneself, it is about being critical about personal experiences in the develop-ment of the research being undertaken, or about experiences of the topic being investigated (2013). Even though my writings are autobiographical or self-reflective they serve as foundational ground to identify and scope the design outcome.

Reed-Danahay (1997) characterizes three main aspects of autoethnography that are helpful to specify the position of the author of the narratives:

- "The role of the autoethnographer in the narrative: is the autoethnographer an insider or an outsider of the phenomenon being described?" By being an author in the autism spectrum I am placed as an insider in the neurodiversity discourse.
- "Whose voice is being heard: who is speaking, the people under investigation or the researcher?" As a researcher designing for myself I undertake both roles which are specified in the narratives.
- "Cultural displacement: some realities are being described by people who have been displaced from their natural environment due to political or social issues." While I haven't been forcefully displaced of my 'natural environment' there is an argument to be made about the cultural admission of neuroatypical people in their own political and social environment.

Mendez elaborates on Anderson's (Anderson, 2006) distinction between analytic and evocative autoethnography, describing the former as "directed towards objective writing and analysis of a particular group", and the latter as an "introspection on a particular topic to allow readers to make a connection with the researchers' feelings and experiences" (Méndez, 2013, p. 281).

Because of the dual roles that I undertake for this project I adopt an evocative ap-proach for the autobiographical writings as a user and a more analytical approach as a researcher.

Advantages of using autoethnography is that they provide rich data and a perspec-tive to the author's private world (Pavlenko, 2002), and the "ease of access to data since the researcher calls on his or her own experiences as the source from which to investigate a particular phenomenon" (Méndez, 2013, p. 282). However this can arguably provide a narrow point of view constricted from the author's personal nar-rative (Méndez, 2013). Bochner and Ellis refute this argument stating that "If culture circulates through all of us, how can autoethnography be free of connection to a world beyond the self?" (1996, p. 24). Mendez also states her belief that the use of personal narratives can contribute to inform and educate others while sparking reflection and empathy (Méndez, 2013).

## 4.2 Research Through Design

Research through Design (RtD) is described by John Zimmerman and Shelley Even-son as "a research approach that employs methods and processes from design prac-tice as a legitimate method of inquiry" (2010, p.1). While some authors consider it

as design science (Binder and Redström, 2006), Zimmerman et at (2007) make the connection of RtD with “Wicked Problems” that by definition are “not approachable using scientific or engineering modes of inquiry” (Buchanan, 1992, p. 3–20) to ar-gue that the intention of RtD is focused on finding optimal solutions for the current situation (Binder and Redström, 2006). This gives space for the design researcher to work with methods that are unique to design and the design process (Zimmerman, Stolterman, and Forlizzi, 2010).

This team of researchers also propose a model for RtD based on Christopher Frayling’s concept of conducting research through design where design researchers focus on creating “artifacts intended to transform the world from the current state to a pre-ferred state” (Zimmerman, Stolterman, and Forlizzi, 2010, p. 5). They describe the practice of RtD as a continuous process of ideation, iteration and critique of potential solutions where the researchers reframe the problem as they attempt to find opti-mal solutions (Zimmerman, Stolterman, and Forlizzi, 2010). The intended outcome of this process are “a concrete problem framing and articulation of the preferred state, and a series of artifacts —models, prototypes, products, and documentation of the design process” (Zimmerman, Stolterman, and Forlizzi, 2010, p. 5).

## 4.3 Summary

Autoethnography and RtD allow me to place myself in my research as both the re-searcher and the user. They provided the proper tools to use my personal experiences to gather critical insights to reframe the prototype iterations documenting my find-ings through reflective journals with the objective of “evaluating the performance and effect of the artifact situated in the world”.

# 5 Artefacts

The prototyping process combined autoethnographic and research through design methodologies. Autoethnography contributed data collection tools as autobiograph-ical writing and reflective journaling while research through design provided an ex-ploratory and iterative structure of the process.

The process consists of two consecutive iterations with the intention of exploring the research question from the experience of interacting and reflecting upon the use of the artifact.

## 5.1 Prototype 1

### 5.1.1 Description

The initial prototype consisted of a graphical interface displaying a simulated data visualization and a legend. The visualization demonstrated animated sun-related data and body temperature through the course of a day, while the legend shows what each colour represents and the time of solar events. The prototype designed as a digital version, coded in HTML, Javascript and the p5.js framework, and presented on a screen.

### 5.1.2 Process

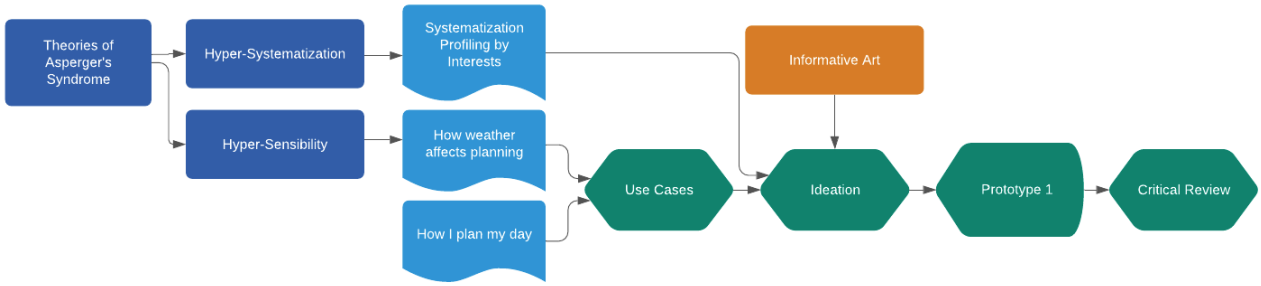


Figure 12: First iteration process.

In the context of identifying the user's planning system, the profiling process was led by the findings in the autobiographical writing from the appendix "C Autobiographi-cal Writing: How do I plan my day". The findings respecting my planning process can be summarized as the following:

- Limited working memory
- Necessity to visualize mentally
- Manage energy around events
- Weather affecting energy levels

From these findings, weather acts as a continuous and variable constraint which has a direct impact on my ability to plan. To monitor these changes could prove helpful to understand and prepare for these effects.

With this in mind I further investigated specific situations in which weather has been an essential factor disrupting tasks in the autobiographical writing in appendix D "How weather has influenced my routines" . Notorious findings are:

· Sensibility to extreme heat or cold temperatures
· Daytime associated with work
· Nighttime associated with free time
· Amount of sunlight greatly affects energy levels

With this information I began conceptualizing the idea of a graphical interface. I started by sketching different versions of the interface. I included sun-related data to provide the user with a context of the course of the day and simulated values of temperature and body heat to explore how they might relate to planning disruptions. Once I had a visual representation of the interface, I moved on to the digital version,

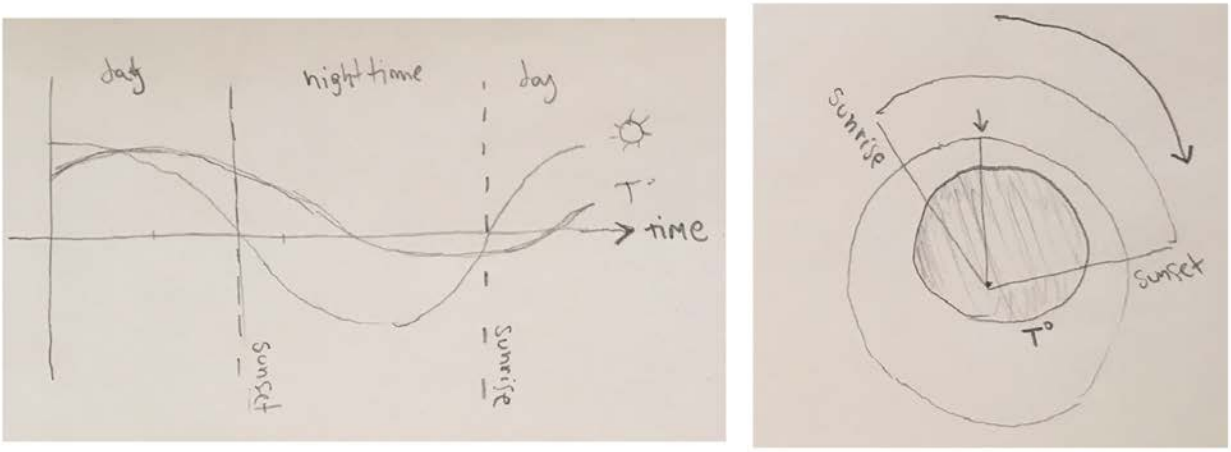


Figure 13: Initial drafts

For the implementation of the digital sketch, I used HTML, Javascript and the p5.js library. I used a colour palette composed to be soothing but contrasting enough to be able to identify what each parameter represents and evoke a calm sense of the passing of time.

Figure 14: Initial Colour Palette

### 5.1.3 Documentation

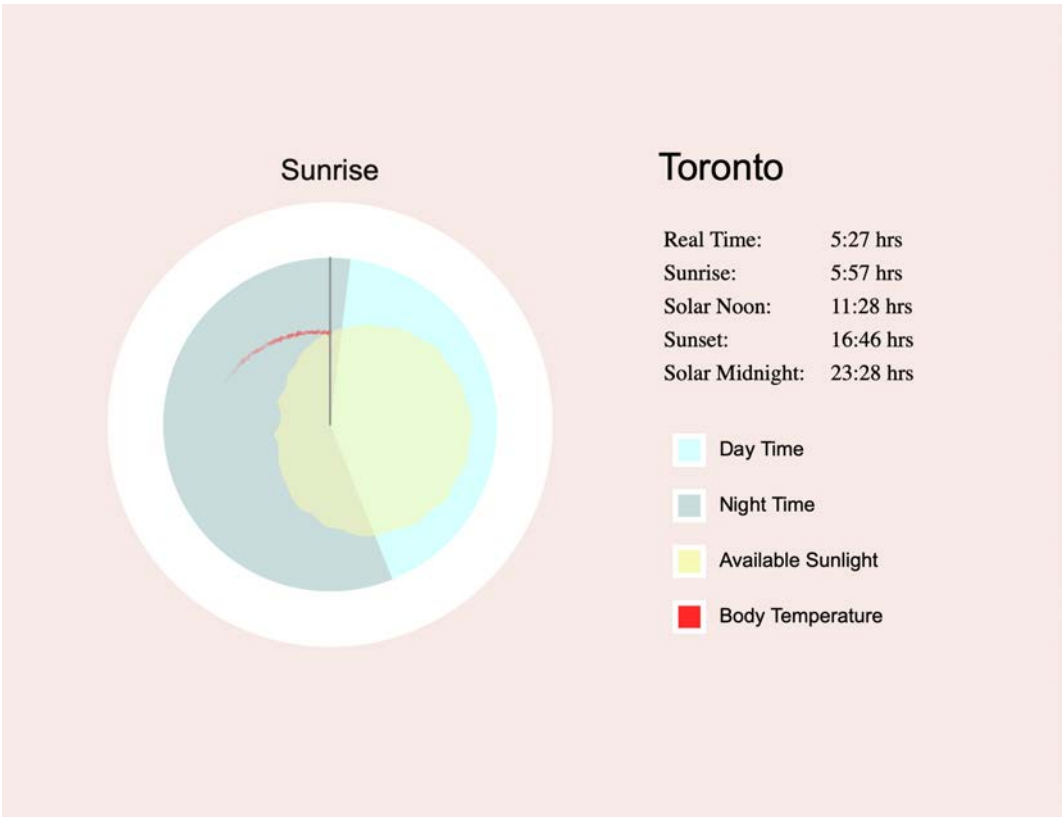


Figure 15: Screenshot of HTML prototype.

### 5.1.4 Conclusions

While the metaphors appear to be an appropriate solution as it responds to motion, natural and action sequences systemizing, further testing requires real live data. The 'body temperature' attribute placed with the intent of contrasting energy levels with the weather data composition, cannot be reduced to data collected by sensors. This approach would also drive the project towards a 'quantifying self' while I prefer the

user to rely on and explore their sense of energy levels and disposition to execute tasks. Further specification of the data is required.

## 5.2 Prototype 2

### 5.2.1 Description

The second iteration of the prototype is an implementation of the previous proof of concept. It provides visual representation for degrees of temperature, percentages of cloudiness and millimeters of precipitation. I also explore the idea of incorporating travel time from home to work, and digital calendar events.

### 5.2.2 Process

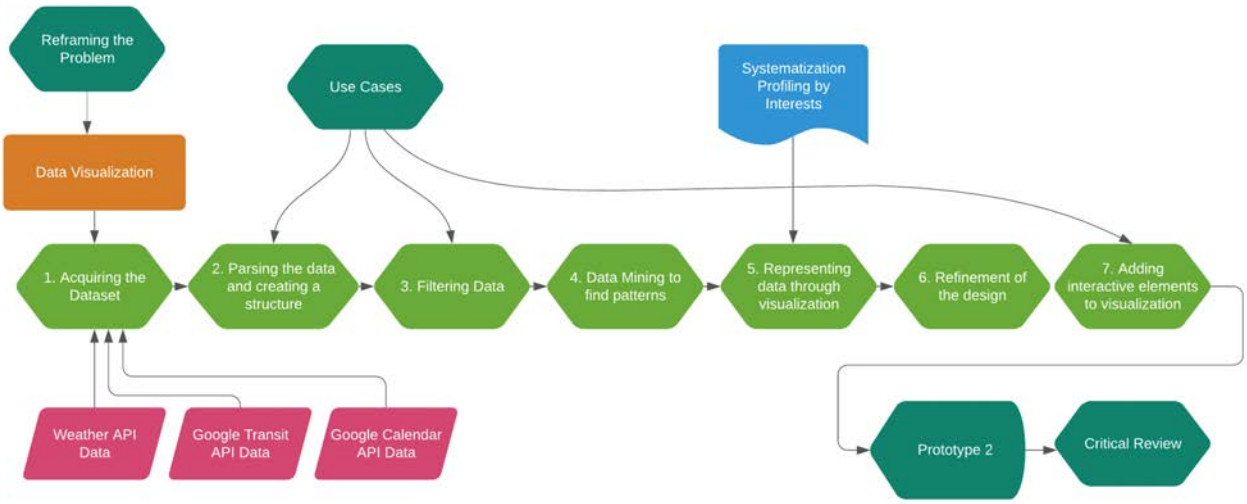


Figure 16: Second iteration process.

Following RtD, the second iteration begins by addressing the shortage of the previous one by reframing the problem into a data visualization one. To address this I follow Ben Fry's seven steps of visualization (Fry, 2008, p. 1).

Fry uses a diagram to describes a seven steps process data visualization, including acquiring the dataset, parsing, filtering, data mining, and representing the data. Fry points on the data acquiring phase and the filtering phase, suggesting to consider the frequency of the change, and on the connections between the steps as an indi-cation of the importance of having an overview look on the project (Fry, 2008, p. 1).

**1. Acquiring the dataset**

The initial development of this iteration integrated a Weather data API from open-weathermap.org. Later, it would include Google Transit API data for travel times and Google Calendar for calendar event data.

**2. Parsing the data and creating a structure**

Guided by the autoethnographic writings, I could identify the most relevant pieces of information: Sunlight and cloudiness, daytime and nighttime, meetings and events.

**3. Filtering data**

Notable weather data I left out was pressure and humidity data as it wasn't a factor noticed in the autoethnographical writings. Moreover, it would clutter the interface which its user has a limited working memory.

**4. Data mining to find patterns in the dataset**

As most attributes in the dataset are predictive, the only pattern is that it comes in intervals of three hours. I chose to represent the data transparently in these three hour blocks

**5. Representing the data through visualization**

Representing the data intended to appealed to the systematization types.

cular shape conveys twenty-four hour data to represent a full day.

Point six gives a more comprehensive description of metaphors used.

## 6. Refinement of the design

### 6.1. Implementing weather data feeds.

For weather data, I chose openweather maps API, as they provide a low-cost daily weather forecast with multiple measurements points along the day. These data points are divided into eight periods of three hours each, which I chose to expose in the octagonal shape. A linear interpolation evidence the intervals of the data and the computational nature of predictive weather.

### 6.2. Composing a language of metaphors with different units of measurement.

All the different data elements represented have different units of measurement. Cloudiness is in percentages, temperature in degrees, rain in milliliters, etc. Temper-ature originates at the center and stretches depending on its intensity. Testing in summer with the first design where the scale was bigger, it was easier to identify changes in weather, but winter testing revealed that it couldn’t accommodate the minus thirty degrees of Toronto. A smaller scale and a bigger offset from zero was implemented.

Data of cloudiness and rain is visualized from the external borders of the wheel increasing their volume towards the center point, as a visual analogy of physical clouds and rain coming from the sky.

### 6.3. Integrating simulated calendar events to test metaphors and usability.

Arc segments over the weather data were tested to represent calendar events. The

arcs span across the time segment in which the event will take place and appear only twenty-four hours before it finishes, and disappear after it's completed. With the purpose of having a cleaner interface and the intention of focusing on current tasks, the name of the event is only visible when the task is active.

### 6.4. Integrating work-home travel time to plan around high traffic.

Throughout the testing periods, I notice that a constant in my planning process was to avoid rush hours of public transport. I tested representing trip data from the Google Maps API with the intention of identifying periods of congestion. Three arcs represent the travel time between my workplace and home on ten, twenty or thirty minutes early to the event.

Testing was made with fixed locations and the variations were too little to perceive. Assigning an extra attribute to the event to understand the origin and destination of the event complicated the usability and finally, I decided to remove it.

### 6.5. Implementing calendar events through Google's Calendar API.

The implementation of calendar events followed the design choices made in point number three. Due to the existence of shared spaces calendars which have events that do not concern me, and to have more control of what is shown in the visualiza-tion I created a new calendar.

Deciding which events to move to this calendar gave me a sense of order and agency towards my daily routine.

## 7. Adding interactive elements to visualization

The main interaction is to be able to drag horizontally across the screen to move the

visualization back and forth through time. This is useful to plan ahead of time and to find patterns throughout the week.

**Implementation**

This prototype was developed in the Unity3D game engine using C#. Each attribute's data is visualized in a procedural 3D mesh, with a computer graphic shader that calculates which segment is required to be rendered at any moment.

Figure 17: Second Colour Palette.

The colour palette for this iteration consists of more vibrant and contrasting tones, aiming to be used in a projection.

### 5.2.3 Documentation

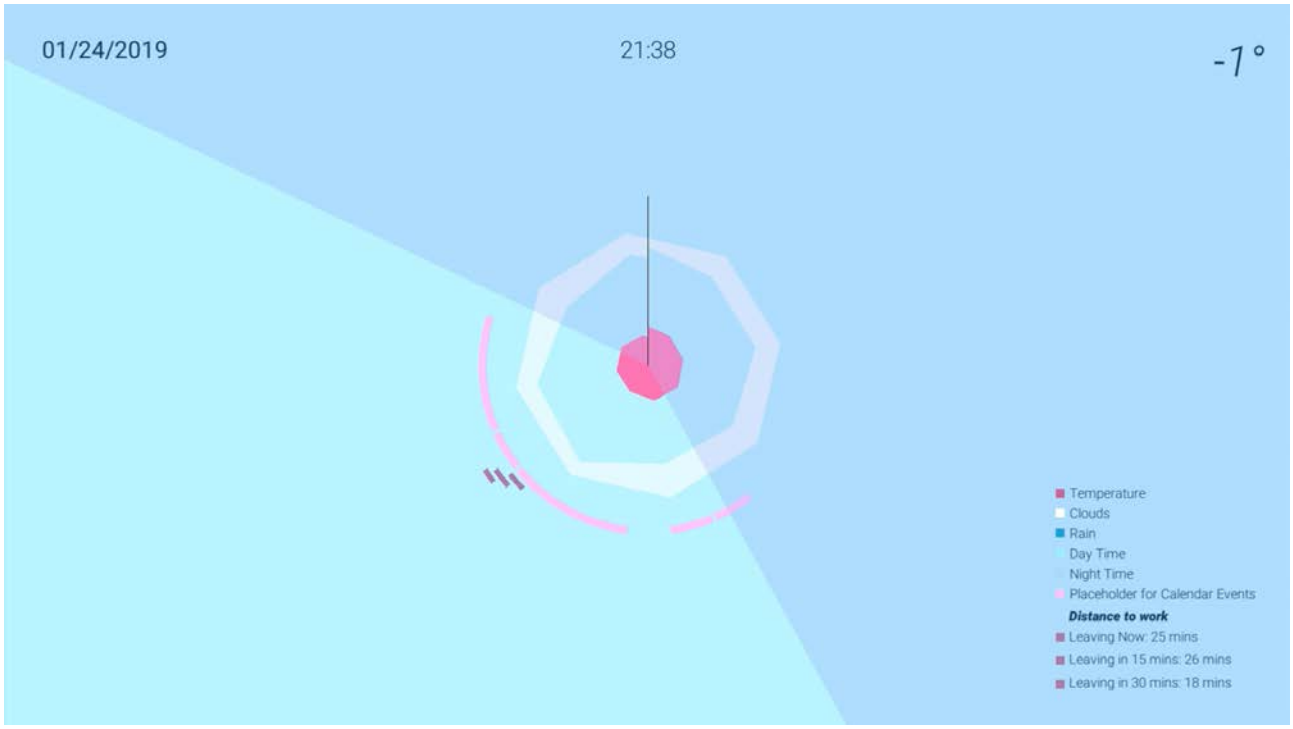


Figure 18: Screenshot of the second prototype.

### 5.2.4 Conclusions

Through the use of the APP and familiarization with the interface, identifying problematic situations becomes intuitive. This encouraged to visualize more data as travel time and calendar events.

Travel data provided the commute time effectively but the variations that evidence how busy the transportation system is too little to visualize with these types of metaphors.

Calendar data requires tagging or filtering, as shared digital calendars present events that do not involve the user. Identification of events with text or a summary of the day may be useful for accurate planning.

The minimalistic approach and placement of the current data at a fixed vertical po-

sition were comfortable to read and helped to maintain focus on the current task at hand.

The app was tested as in a mobile device and a desktop computer on screen and projected. As a mobile application, the interaction was more natural and intuitive to discover. Moreover, having to access the application in any device, introduced an active effort. A more suitable solution might be designing a calm physical artifact that is always running or to create an interactive wallpaper or browser extension as they can embed in the user's routine.

Additional journaling of user testing can be found in Appendix F Reflection on the use of the tool.

# 6 Conclusion

## 6.1 Conclusions

The goal of this thesis project was to find suitable ways in which technology could assist planning for people with Asperger's Syndrome in their terms and supporting their methods in order to mitigate the distress caused by the necessity to adapt to neurotypical systems.

By presenting my story through autoethnographic methods and the continuous iterative process of reframing and prototyping of RtD, I was able to set grounds on developing a tool that can assist in my planning process.

My attempts to answer the question 'How can we design a planning tool for people with Asperger's Syndrome?' were discouraged by the majority of both the literature and tools available. In this situation I found myself holding onto the few pieces that aligned with a reasonably inclusive narrative and decided to build from there.

Through this process, I found that special attention needs to be placed in hyper-sensibility and hyper-systematization types, in the interest of avoiding unnecessary distress and leverage from the user's comfortable domains.

The agency and individuality of the user cannot be overlooked. Most design research projects I found are targeted to caretakers and parents of people in the spectrum. One of the tools reviewed in this document which was developed by a parent is ad-vertised to "keep your children quiet". My impression is that without more adequate research "we" cannot design for AS, and would encourage the person to design for her/himself.

## 6.2 Limitations

This research project suffered from various major transformations. The previous forms paved the way to my diagnostic, and further absence for a year of the program. This confined the project into a shorter time frame in which several aspects remained unexplored.

Inclusive and universal design were not discussed in this document as I made the choice to use the time available to explore the subject starting from the autobio-graphical writings. And in parallel, "translate" and further develop the methods from my practice even if it led me to reinventing a couple of wheels.

Another time limitation was being able to properly user test the artifacts beyond critical reflections and with other users, in order to support the validity of the overall process and effectiveness of the proposed solution.

## 6.3 Future Work

### Physical Artefact

This thesis explored the artifact as a digital mobile application and as a projection. Future iterations may investigate the benefits and limitations of a physical artefact, how this can be embedded in the user’s routine, and the metaphors that can apply to physical materials and mechanisms.

**Standardization of the profiling process**

The categorization of interests based on hyper-systematization type provided rich personal insight. As a profiling method, it allowed me to identify underlying systems that resonate with my type of thinking that I ignored. I realized the appeal that these interests have and how I use these systemization types to classify and interpret phenomena. I believe that standardizing and implementing this process can be valuable to understand how to design for people from the ASC community.

## 6.4 Final Reflections

In order to successfully design tools for neuroatypical people, there is still much to un-derstand. Throughout the process of researching and developing this thesis project, I came to the realization that not only more research is necessary but also steering these research projects towards acceptance and recognition.

The marginalization of neurological minority groups is pervasive. It occurs within sci-entific research by defining differences as impairments. Socially, by imposing neurotypical dynamics of communication. In schools by invisibilizing different learning processes. And in the workplace by failing to recognize the value of a different set of talents.

# Appendices

## A Reflective Journal: Finding a place in design dis-course

Being placed in an academic context required that I position myself somewhere within the digital design discourse. I found this to be problematic for three reasons, that after my diagnosis I can identify as common challenges for aspies: As a detailed-oriented visual thinker, I need to know "everything" before I feel confident in writing. I struggle to grasp and contextualize the implications of abstract concepts. And I often change the subject I am interested in.

Before the diagnosis, I was interested in the relationship between the analog, digital and nature. How they interface and the information loss between them and subjects like biomimicry and biophilia. My interest followed the notions of embodiment and still clueless of my condition I place found myself basing my work in a framework which presented a use case focused on an individual with Asperger's.

After being diagnosed, I started educating myself on the implications of this "im-pairement". I found out about the social model of disability and neurodiversity move-ments. I align myself with the latter, although there is still plenty of representative research to do.

Soon back into researching, I found that embodiment theorists ground their work on Heidegger's notions of embodiment. Which (besides being a nazi) Neil Leach criticizes for reducing the being to a universal one.

Being part of the autistic community I had to disagree. If something I've learned throughout my life, in good and bad experiences, and now in a diagnostic, is that I am neurologically different.

Leach, on the other hand, believes we can get used to technology. He gives the example of getting used to a new house that in the begining we find undesireble that later feels like home. I disagree also with this as 'masking' neurotypical constructs are known to produce stress and anxiety.

Varela's work is more adequately aware of the subject that is perceiving. The term Enactivism argues that cognition arises through a dynamic interaction between an acting organism and its environment. "It claims that our environment is one which we selectively create through our capacities to interact with the world".

In this, I find some type of comfort, but Varela wasn't on the spectrum. And each person on the spectrum is wildly different. I have a visual mind, but not as lucid as Temple Grandin's. I'm good at math, but not a savant, which is apparently what science often finds interesting to study.

I started then from the beginning, profiling myself.

*continues in next appendix*

# B Reflective Journal: Profiling myself

I started this process by embracing the phrase "restricted and repetitive patterns of behaviour and interests", listing chronologically my topics of interest. I attempted to classify these interests in types of systemizing, following Baron-Cohen's work (see chapter 2). The findings show Numerical systemizing leading with 9 appearances. Other reappearing systemizing types are Natural with 6, Mechanical with 5, and Action Sequence and Collectible with 4.

Interests / Systemizing types

| Topic | Sensory | Motoric | Collectible | Numeral | Motion | Spatial | Environmental | Social | Natural | Mechanical | Auditory | ActionSec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Drawing | 1 | | | | | 1 | | | | | | 1 |
| Math | | | | 1 | | | | | | | | |
| Creating systems that represent aspects of the world | | | 1 | 1 | | | | 1 | 1 | 1 | | |
| Gaming | | 1 | | 1 | | | | 1 | | | | |
| Coding | | | 1 | 1 | | | | | 1 | 1 | | |
| Astronomy | | | | 1 | 1 | | | | 1 | | | 1 |
| Hacking | | | | 1 | | | | | | 1 | | |
| Metaphysics | | | 1 | | | | | | 1 | | | |
| Interactive Electronics | | 1 | | 1 | | | | | | 1 | | 1 |
| 3D animation | | | | 1 | | 1 | | | 1 | | | 1 |
| Biomimicry and A.I. | | | 1 | 1 | | | | | 1 | 1 | 1 | |
| Total | 1 | 2 | 4 | 9 | 1 | 2 | 0 | 2 | 6 | 5 | 1 | 4 |

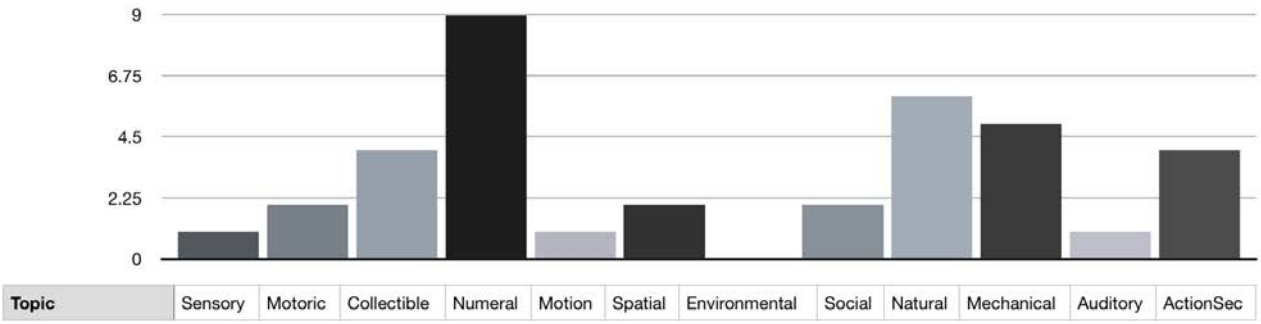


Figure 19: Categorization of interests by systemizing type.

While trying to categorize the interests I found that the types of systemization are identified through an impairment-oriented lense. I had to stretch the categorization

to fit both my take on the topics and the type of systemizing. Coding per example has always been interesting for me while trying to replicate systems found in nature, as is in a way a practice I use to understand nature. This considerably oversteps the scope of the examples given: "asking over and over again what the weather will be today" and "learning the Latin names of every plant and their optimal growing conditions". No further definitions or characterizations of the types are given.

While my findings serve as a starting point, the underrepresentation of autistic voices in academia seemed evident.

To profile me as a type designer I looked at my education and practice.

My education has heavily relied on a rizhomatic type of autodidactism. I am a maker, and I learn through it. My focus has always been in the artifact and I found in research through design structures and theories of formalizing this process.

To profile me as a user I took these findings into consideration and described "How I plan my day" and then specifying "How weather has influenced my routines". Both texts found in this appendix.

# C Autobiographical Writing: How do I plan my day

How I divide tasks is based on the Divide and Rule principle which I've adopted from my experience coding. In this way I can focus on tasks that are small enough that I won't have trouble using my limited working memory on. This still requires me to be able to visualize the whole of the project in my mind to understand how each part works.

The process of planning my overall day is mainly focused on managing energy. Being hypersensitive and exhausted by social interactions force me to plan my day around tasks that drain me. I list the tasks that I have to do that day and assign them a weight related to how much energy it will require for me to complete them. When a task is exhausting I need to allocate time to rest or reset after.

To 'reset' can mean the same as rest, as in taking a nap or lying down. It can also be just doing an activity that shifts my working memory as taking a shower or watching a video.

To illustrate an example, the lack of sunlight affects my energy levels and makes following through with my planned day more difficult. The amount of energy I can spend in these tasks is less, the amount of energy required to commute or leave my house is greater and I have to allocate more time to rest. Similar results occur with heavy snow, rain or very cold days.

## D Autobiographical Writing: How weather has influenced my routines.

My early childhood is characterized by travelling from Chile to Canada and back. The evident difference in climates affected me severely. As a Chilean kid that grew up in Calgary, I couldn't handle the heat in Chile. I was sick the whole summer and my parents after realizing I couldn't acclimatize, built a swimming pool where I could cool off. Now as an adult I don't do well in either cold or hot weathers, as they impede me from realizing my habitual daily tasks.

Nighttime has always been more favourable for me to work at. But there is a further distinction to make. Nighttime has historically served me as a refuge from cam-ouflaging. At night I am no longer pressured to engage in social interactions and meetings and can freely dispose my time to my personal interests. The overall noise of the city is also reduced at night which makes it easier for my hyper-sensibility to sound.

Daytime is then related closer to social interactions and socially demanded work. My hyper-sensibility to light also makes changes in available sunlight very important.

# E Labour Party Neurodiversity Manifesto Principles

- The social model of disability: Disability is caused by society creating barriers to the equal participation of impaired (or neurologically different) people.

- The neurodiversity approach: Humanity is neurologically diverse; people have different brain wiring. ADHD, dyslexia, autism, dyspraxia, dyscalculia and other conditions are neurological differences. We want human neurodiversity to be accepted not suppressed or cured. (See our website for neurodiverse profile prevalence figures.)

- Opposition to austerity: We need adequate public services, benefits and wages. We oppose government and local authority cuts to these – they are a political choice, not an economic necessity.

- Socialism, democracy and solidarity: As a prospective Labour Party manifesto, this document bases itself on labour movement principles. We want to chal-lenge the deep social roots of discrimination against neurodivergent people.

- Nothing about us without us: Policies and services, and the Manifesto itself, must be shaped by neurodivergent people themselves.

# F Reflection on the use of the tool.

**Day 1.**

Today's journaling is written after using the tool to plan my day outside. At 10:45 am, after my morning routine, I take some time to review my schedule. I'm already familiarized with the interface, and through a quick scan, I notice that tomorrow morning will be raining. I swipe right to the next days, thinking it will rain all week, to partially confirm my worries. This evokes a mild bitterness for what's to come and some motivation to seize Today's weather.

The next thing I notice is how far the visualization has moved from the equinox, which reminds me how far ahead we are in this year, and makes me question the current progress of my goals. This realization contrasted with the stillness of the visualization proves to be a daunting experience of time. There is also a feeling of a discrepancy between the current and expected weather.

**Day 2.**

Today I used the tool right after waking up at 7:14 am. I spend some time ideating complementary tools like a daily tracker of tasks that could help me visualize how much I smoke every day, or a sort of grouped tasks to include a morning and night routine. I realize there is almost no structure in the tool. The only constant is the three-hour intervals, but they don't correlate to neither weather or calendar events.

I have this dilemma of moving towards a more structured approach or following the initial objective of allowing spontaneity. And a debate whether I approach this need for structure as a user, a designer or both. For now, I will use the available features

and create the routines as calendar events.

**Day 3.**

9:43 am, the first day and I already failed to follow the morning routine. The visual-ization shows that all day will have the same weather, low temperature and highly clouded. This plus the evident lack of sunlight outside, being the weekend and over-sleeping sets me up for a poorly motivated day. I imagine having sunlights turning on automatically for these situations.

I fell asleep again and woke up in the afternoon. Looking at the app one more time and seeing the little proportion of sunlight left gives me a sense that the day is over. I reflected on how actively monitoring time feels like being on a timer. Being on time, late, having to occupy time and the measurement of quiet moments as time wasted.

**Day 4.**

1:35 pm, Sunday. I look ahead of time to start mentalizing about my week. The process of evaluating using the tool has felt pretty much internalized. Although the requirement of journaling for a week makes me fixate on trying to find insights. I think that this shift of use has made me look at the project more like a product than a tool. An artifact that I'm required to pay attention to, instead of something to discover.

This experience makes me think about the pervasiveness of the structures that create conflict on my behaviour. And the negotiations between these structures with auton-omy and health. Camouflaging is not only present in conversations, or in how I work, but in what I work in, and the direction I take it. These negotiations are exhausting,

**Day 5.**

After yesterday's journal, I kept thinking about the negotiations I've had to do. It took me some time to regain the courage to open the tool and sit down to write this. It's 2:32 pm, still cloudy and low temperatures.

This exercise of journaling puts in evidence my ability to overthink things, and now I wonder if this is the type of journal that I've been asked to do. A camouflaging kind of thinking.

I wonder if that's the type of metric that would prove that my tool is successful, a pain scale that identifies how much I've had to camouflage each day.

**Day 6.**

Today I've had work meetings all morning. I glance at the app at 3:07 pm. Cloudy and cold. I look forward and find some pockets of time with more sun. My current energy levels are very low which I can attribute to the amount of work I have to do, the stress of being required to do this work in an expectable neurotypical manner, and the weather forecast.

In my pessimism, I wonder if the seasonal changes of weather and global warming are also linked to neurotypical agenda. Or if there is any room for neurological mi-norities at all that don't involve the pains of negotiating, where the validity of your type of thinking and being is put to an unfair test and invalidated by the force of being outnumbered.

**Day 7.**

Today opening the tool seems pointless. I know what it shows, I've seen it the past

few days.

I've been contemplating the strategies I can utilize to achieve the objective of the tool; to gain some terrain against camouflaging. And in my current state, sleep de-prived, exhausted, and honestly hurt by the constant microaggressions, I can't find the energy to negotiate.

Even allies that try to empathize normalize my experiences telling me that they've felt this too, that other students go through the same. Most of them say this trying to comfort me, and with some, I try and fail to explain, or they fail to understand, and with others, I don't have the heart to correct them.

I find similar narratives in online autistic communities.

It seems like every neurological group understands itself and has its own descriptions of what is obvious and their own blind spots. But minorities have to explain the nature of their obvious in the words of the majority and actively fear the repercussions of missing a blind spot, spending an enormous amount of energy and in detriment of their physical and mental health.

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# Glossary

**Asperger's Syndrome** Asperger syndrome (AS), also known as Asperger's, is a developmental disorder characterized by significant difficulties in social interaction and nonverbal communication, along with restricted and repetitive patterns of behavior and interests.. 9

**Autism Spectrum Disorder** Any of a group of developmental disorders (such as autism and Asperger's syndrome) marked by impairments in the ability to communicate and interact socially and by the presence of repetitive behaviors or restricted interests. 9

**camouflaging** The strategies used to compensate for or mask autistic characteristics during social interactions.. 5

**neuroatypical** Having an atypical neurological configuration.. 14

**neurodivergent** Sometimes abbreviated as ND, means having a brain that functions in ways that diverge significantly from the dominant societal standards of 'normal'.. 8

**Neurodiversity Movement** Social justice movement that seeks civil rights, equality, respect, and full societal inclusion for the neurodivergent.. 7

**neurotypical** Often abbreviated as NT, means having a style of neurocognitive functioning that falls within the dominant societal standards of 'normal'.. 45