The paradigm shift from normative to neurodiversity gives brain research a foundation.

Emancipation

The concept of Neurodiversity is not only an emancipatory term of adhd-, dyslexics- and autistic people to declare their disability to be a talent, in response to a lifelong adaptation to other people's norms at their own expense. Neurodiversity is also a paradigm shift in neuroscience, following the old normative paradigm that assumes that only the average way in which the brain works is 'good' and the deviations from this average are a 'disorder'. Through the perspective of Neurodiversity, there are several brain types. These are different brain systems to process information. Each braindiversity has its own neurodevelopment with its own talents, pitfalls and disorders. So Neurodiversity is not denying disorders, but it is understanding these disorders from within its own context. Each braindiversity could have a relative well functioning or a stuck variant. A person who is stuck, -lets say a burnout adhd person- should not try to become ''normal'' but try to become a well functioning adhd person. Trying hard to fit into the habits of an average person may very well be the exact reason a neurodiverse person gets ill.

Plasticity

But besides this emancipatory movement, if you add Neurodiversity to the mix of other trends in neuroscience, like plasticity, probabilistic genes, the revived link between biology and pedagogical developmental stages, new technical ways to visualize neurocircuits and bigdata correlations around physiology: we find that the perspective of Neurodiversity is the missing link in the entire neuroscience. Unexplained vague correlations are getting much clearer when we look through the perspective of Neurodiverse science. This new paradigm changes brain-science at its core.

Neurodiversity is the synthesis that connects old opposites from a higher level: nature-nurture / biology-pedagogy /healing-improving/disorder-health.

Brainarchitecture: building functional circuits with neuroscience custom made for divers brains

If we plasticity and probabilistic genes with neurodiversity, we arrive at a new theory we call "Probabilistic Neuropathways". Take Jay Belsky's plasticity genes one step further and also add developmental stages from pedagogics to the mix: every neurodiversity, initiated by genes and coming to manifestation through environmental factors starts to build neurocircuits. But the neurocircuits have their own logic. If not everyone has the same foundation, the whole construction of neuro-circuits on top of that will be different with every neurodiversity. Often behaviors of certain neurodiversities are considered characteristics of these genes, while they really are coping strategies. It takes qualitative research -not MRI scans and interviews- and experiencial knowledge -not statistics- to find out how the brain organizes itself with the tools it has. Only after we have a more intrinsic understanding of neurodiverse circuits and development we could formulate hypothesis to test certain correlations with bigdata.

Methods: functional tests and self-reported neural pathways

An important difference with the old paradigm is that Neurodiversity works "bottum-up" instead of "top-down". There is an emphasis on qualitative research methods. Pedagogical developmental phases and the connection of braincircuits are now directly linked to biology. Below are 2 examples that illustrate this:

1 Thanks to dyslexia, we know that three factors – visual form of letters, meaning of the word, and phonetics - must be linked in order to read quickly. Phonetic dyslecics have neuropathways that connect form and meaning, without phonetics. During a functional test, in which the subject has to

read Finnish texts out loud (provided the person does not speak Finnish), someone without dyslexia can easily pronounce the words without knowing the meaning, but the phonetic dyslect cannot.

2 Thanks to autists, we know that cognitive and emotional empathy (ce and ee) are two information processing systems that are incompletely linked in Autism. Kathy Marshack (2013) compares difference in thinking patterns between her 2 children (1 with and 1 without ASD) and herself and her husband with ASD. And as a therapist she has access to many examples from other families. By studying and analyzing these different thought patterns in detail, she finds important insights that -as a PhD- she could not find in common statistic brain scan research. By describing her method, her private observations are repeatable and comparable by others. Not only does this create new fundamental insight into the functioning of the autistic brain, this unique angel sheds light on how neuropathways connect in the average brain.

This knowledge would never have emerged without the intrinsic study of neurodiversity. Statistical normative comparisons of data from brain scans would not have provided this knowledge. Qualitative research provides the hypothesis and statistical research can test this hypothesis. Using functional tests.

It is precisely those persons whose development is atypical that show which development paths are fundamental, which are reversible, what brain functions can be linked together and what the consequences are for subsequent development phases without that link. Atypical neuropathways reveal where the neuro-crossroads and 'windows of opportunity' are located.

Probabilistic and plastic neuropathways

In 1998 Eric R. Kandel wrote his influential article 'A new Intellectual Framework for Psychiatry'. Genes have a ''template'' function: a transmission system of genes from generation to generation that is unchangeable by the environment, except by rare mutations. But the same genes in the nucleus of each cell also have a second ''transcriptional'' function: it specializes the cell into a brain- muscle- bone- or other cell. The genes produce proteins. This ''transcriptional'' function of genes is strongly influenced by the environment. "*Thus, a small number of proteins, or transcriptional regulators, that bind to different segments of the enhancer element determine how often RNA polymerase binds to the promoter element and transcribes the gene. Internal and external stimuli - steps in the development of the brain, hormones, stress, learning, and social interaction - alter the binding of the transcriptional regulators to the enhancer element, and in this way different combinations of transcriptional regulators are recruited. This aspect of gene regulation is sometimes referred to as epigenetic regulation*". (Kandel 1998 p. 461)

Genes that underlie neurodiversities (autism, adhd, add and dyslection) but also borderline, for example, are sometimes called ''vulnerability genes''. The idea is that circumstances can activate the gene. Thus, safely attached people with a certain gene do not get borderline, people with the same gene during trauma and unsafe attachment do develop this disorder. Jay Belsky (2009) goes one step further: Neurodiverse genes are not ''vulnerability genes'' but *''plasticity genes''*. The plasticity of the gene works in two directions: for better or for worse. Under favourable conditions the transcriptional function of the gene provides an extra successful variant: they perform better than the average population. So the very same gene that is associated with violence or oppositional disorders is the gene that breeds more than average calm and peacefull people given a good upbringing. The very same gene that is statistically associated with more depression is associated with far less depression than the average population when not raised under adverse circumstances. Genes associated with adhd for example show overrepresentation among overachievers (just look at who wins golden medals at the Olympics) as well as among underachievers. The very same gene that delivers kids

with the attention span of a goldfish could also give them the raisor focus of a fireman: If only we understood the two edged sword better: in what soil does this seed grow best: what are the triggers, the windows of opportunity and how to turn this ball and chain into a diamond?

The other side of the ''disorder'' is an intrinsic part of what scientists should investigate, by zooming out to a view that contains both sides of the coin, one finds more understanding of the process. For example: Although adhd-ers are over-represented in the population in detox centres (Centrum Mailiebaan Utrecht diagnoses 20% of addicts to Cocaine who enter as adhd-er), they are more successful in staying clean. (After a year 80% of the detox-group has fallen back into addiction, but the adhd-ers are strongly over-represented in group that was still clean after 1 year). Knowledge about the entire axis around which a phenomenon revolves provides more knowledge about the disorder and its statistical overlaps (called 'comorbidities' in normative research), but also may also help the other addicts. 3D knowledge -from both sides of the coin -provides more fundamental insight into how addictions work in the brain, the role of dopamine and the role of coping strategies (resilliance).

In summary, neurodiverse genes often have more plasticity into two directions. In addition, neuropaths build on the foundations of previous neuropaths. While growing up and during life each brain has fewer opportunities for intraconnectivity and more opportunities for specialisation. Finally, the intrapersonal drive is important in the development of neuropaths in a certain direction. One person might bypass a bad functional connection by making detours, while another will make use of the unique possibilities of this special braindevelopment and devote all his energy to specialising neuropaths into one direction. The motivation for this is strongly influenced by the previously constructed neuropaths and their ability to receive internal feedback, and the feedback from the external environment. After all: without feedback -whether this is physiological, cultural or psychological-, it is impossible to build neuropath through the brain. It is a self-unfolding system strongly dependent on input. If the environment tries to install Apple software on a Microsoft computer, as it were, this will not work. The neurodiverse brain does not develop fully when input is not appropriate.

Neuropath mapping

The first neuropaths that are constructed form the foundation for the next stages of development of the brain. Once a path has been taken, new possibilities unfold as the child develops. These possibilities are different for each brain divergence. One can draw a brain map – a tree diagram- of genetic possibilities, windows of opportunity, crossroads: connection of braincircuits, necessary external input that is or is not offered, choices: a drive to create detours or, to further specialize.

With knowledge of neuropaths one knows more which developments can be adjusted and which cannot, and how we make optimal use of them. How does information processing of the brain progress, via which pathways, how are these paths constructed?

The new paradigm of neurodiversity links disciplines such as medical, pedagogy, genetics and physiology through common intrinsic themes. It puts an end to the old DSM behavioural categories in favour of measurable function profiles. It has silenced self-legitimizing discussions (does or does not exist adhd / healing vs improving). Neurodiverse research is concerned with intrinsic and functionally measurable themes (systemizing empathizing/ flow or procedural concentration / conceptual and lineair thinking) . It restores the connection with fundamental brain theory by providing qualitative hypothesis that are based on actual life experience of people instead of just randomly trying to find statistical correlations in patientdatabases. Through a connection with

fundamental theory, more causal relationships can emerge and there is a direct translation into practice and leads to how patients can influence their neuropathways.

Neurodiversity is 'the carpet that ties the whole room together'.

Optimising instead of normalising
Under the old paradigm, ''enhancing'' was taboo and only ''healing'' was legitimized. Especially diversities with medication like adhd. This old dichotomy does not apply to the new paradigm. Neurodiversity seeks to optimize somones functioning within the context of their own possibilities and wishes. A highly gifted dyslect may have good grades but still be syntactically dyslectic and benefit from special dyslexic teaching methods and visual planning boards. The normative paradigm with DSM uses categories where ''dysfunctioning'' is the essential determinator. But to people whose entire chain is strong, repairing a weak link means the most progress. Braindiversities are overrepresented among gifted people. Their ideal is not conforming to an average, but to prevent bore-out, burn-out and to connect their talent to society.

Neurodiverse adjustments
As soon as the adjustments of a certain group transcends normalization and goes its own unique way, we see a great aversion from society:

- For decades, the blind had to take action to be able to teach Braille at schools for the blind. 3D punched out letters equal to the letters of the seers were allowed. Only a Braille lettering that was specifically intended for the blind was not allowed.
- For a long time, deaf people were forbidden to use sign language, only lip-reading was allowed. Sign language is a language of its own that originates from the unique neurodevelopment of deaf people: not gestures for every phonetic letter but a language that can make more use of conceptual thinking and grammar and elevates it to a higher level by freeing it from the phonetic language and semantic grammar of hearers.

Someone who comes out at work or school as someone with a neurodiversity is often told immediately: "be careful not to use this as an excuse". Pressure is put onto people to conform to the norm and people who go into the other direction meet hostilities. Mental health is associated with the norm, if you say you are functioning well it is said you have overcome your neurodiversity and no longer have it. It is denying the scientific facts that information is processed in the brain in different ways and that certain ways have a name regardless of weather or not the person is malfunctioning or thriving.

Lets hope the fight for acknowledgement of neurodiversities does not take as long as the fights of deaf or blind tools. Instead of profiling through statistics and behavioural checklists we could research what they really are on the inside. The individual, society and science as a whole can benefit from gaining knowledge of all possible neuropathic paths. Not every road leads to Rome.

Conclusion
The paradigm shift from normative to neurodiversity gives brain research a foundation. In the old normative paradigm we compared groups of people statistically looking for deviations from the norm. Neurodiversity is the opposite of normative science. This profound new perspective causes a paradigm shift in neuroscience in all its disciplines. It looks for a different type of relationships, uses different research methods and investigates functional themes in an intrinsic and qualitative way. The connection between developmental stages and biology was described by Kandel in 1998. We combine recent knowledge about plasticity, experiencial expertise and systematic methods of ''self-reported neuropathways'' and we map neuro-tree structures. The exception, the abnormal brain,

shows us where the neuropathways cross and what the windows of opportunity are in child development. When do neuro circuits connect and when do they take off at their own specialised path? A revived connection to biology and fundamental brain theory reconnects different disciplines, under the umbrella of neurodiversity.

Normative	Neurodiversity
Statistical	Qualitative
Comparising	Understanding, intrinsic
DSM behavioural checklists	Functional tests
Disfunctioning compaired to groupnorm	Optimalizing intra personal
Categorie boxes	Dimensional
Top down	Bottum up
Patientgroup	Whole group
Enhancing taboo Healing means submiss to the norm	Optimizing intra personal Healing the weakest link of the chain
Research disciplines isolated	Multidisciplinar research
Few hypotheses testing, hypotheses not connected to general theory	Hypotheses connected to fundamental brain research
Comorbidity	Intrinsic overlap / probabilistic system structure

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