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Daniela Cutas
Dorothee Horstkötter *Editors*

Parental Responsibility in the Context of Neuroscience and Genetics

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Chapter 3
Disorders Are Reduced Normativity Emerging from the Relationship Between Organisms and Their Environment

Anna M.T. Bosman

Abstract The rise of modern medicine has led to a distinction between physical illness and health based on physiological measures. Psychiatry, the study of mental disorders, contingent on the medical model, attempts to establish a science that distinguishes between normal and pathological conditions. Following the work of the medical doctor George Canguilhem, this paper provides a conceptual analysis of disorders. Along the lines of Canguilhem, I will argue that medicine and psychiatry cannot be sciences in the sense in which physics or chemistry are sciences (that is, with a claim of objectivity or being value-free), because to establish that someone is healthy or has a pathology requires a normative act – and thus a departure from any ideals of objectivity. Health means the ability to maintain life given the existing circumstances, whereas pathology is the diminished possibility of adaptation to the environment. Because health and pathology are the irreducible result of the relationship between the organism and its environment, an individual cannot objectively be assigned a pathology or disorder.

Keywords Disorder • Pathology • Normativity • Organism-environment relationship • Canguilhem

A.M.T. Bosman (✉)
Faculty of Social Sciences, Behavioural Science Institute, Radboud University Nijmegen, Nijmegen, The Netherlands
e-mail: a.bosman@pwo.ru.nl

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3.1 Introduction[1]

The development and release of the most recent Diagnostic and Statistical Manual of Mental Disorders (DSM-5) of the American Psychiatric Association (APA 2013) has spawned a worldwide and heated debate on the meaning and value of psychiatric diagnoses. This debate covers two main categories, a content (BPS 2011; Frances 2012; Hacking 2013) and a conceptual discussion (e.g., Greenfield 2013a; Grohol 2013; van Os 2014).

With respect to *content*, detailed discussions took place on the issue of whether or not certain diagnoses were still considered eligible as separate categories. For example, Asperger and PDD-NOS were separate classifications in the DSM-IV, they are no longer in the DSM-5 and are now categorised as 'Autistic Spectrum Disorder' (Frances 2012). At the same time, interest groups lobbied for the recognition of a specific problem as an official disorder. The Sensory Processing Disorder Foundation (2012) unsuccessfully campaigned for the entry of Sensory Processing Disorder in the DSM-5. Critique also targeted the increasing range of behaviours considered to be *abnormal*. For example, normal grief is now called Major Depressive Disorder and childhood tantrums are now readily classified as Disruptive Mood Dysregulation Disorder (Frances 2012).

Conceptual disputes concern a rather varied range of topics fuelling the controversy during these historical times in psychiatry, as Decker (2010) characterised its protracted development. The ontological status of mental disorders, that is, whether or not their ontological status is similar to that of medical diseases, is one of the most important of these topics. The causes of a large number of medical diseases, certainly not all, are known, whereas those of mental diseases are not. Although some psychiatrists maintain that mental disorders are in fact brain diseases, van Os (2014) argues that we are far away from a clear connection between brain abnormalities and overt, pathological, behaviour. Another problem that troubles the discussion is the absence of a unified theory of mental disorders (Frances and Widiger 2012). A final dispute was put forward by Greenfield (2013b) who states that the fundamental role of culture in the aetiology of mental problems has been severely neglected. Culture and environment can have a significant role in the causation and development of disorders.

Unlike Greenfield, I intend to show that disorders are the result of inherently normative acts that emerge from the irreducible relationship between the organism and the biological environment. This view on disorders has clear implications for the debate on responsibilities for parents and caretakers of children who have problems coping with life. Rather than dealing with whether or not X is a disorder, I will

[1]This chapter is loosely based on a paper presented on the 9th of December 2013, at the symposium "Parental Responsibility in the Context of Neuroscience and Genetics", organized by the Department of Health, Ethics, and Society of Maastricht University in Maastricht, the Netherlands. I would like to thank Ton Mekking for his contribution on the issue of measuring temperature, Marianne Reuling for an in-depth discussion of the societal implications and Nora Loretan for her careful reading of the manuscript.

make a conceptual analysis of the terms 'normal' and 'pathological' or 'normal' and 'abnormal'. What does it mean when we say that behaviour is pathological or abnormal? The French medical doctor and philosopher George Canguilhem (1904–1995) wrote a profound and radical book about this issue.[2] My contribution is much indebted to his thinking.

3.2 How Health Became the Norm

The modern approach to diseases originates from Hippocrates, the father of Western medicine, who maintained that diseases occur naturally rather than as the result of an act of God. He stated that nature is in harmony or equilibrium and disease is the disturbance of this harmony. Because equilibrium in the organism consists of the four humours: blood, phlegm, yellow and black bile, it is the disturbance of these humours that results in disease. Disease is not so much the disequilibrium itself, but the effort to restore equilibrium. The organism develops a disease to re-establish the proper distribution of humours; it is a response to an internal battle between forces. The classical Greek view on health reveals that sickness and health are two distinct qualities, caused by a shortage or excess of something, namely, humour, and they refer to a different organisation of the organism (Canguilhem 1966). Note that this view reveals that disease is not disorder; it is another kind of order.

The nineteenth century saw a change. The discovery of germs led to the view that a disease *enters* the person or organism. Something pathogenic that comes from the outside causes *malheur*. The fact that we can detect a germ (i.e., bacteria or virus) in the body appears to guarantee an ontological cause of the disease. According to this view, disease is the result of the battle of the organism against an enemy from the outside.

Modern medicine evidences the existence of an illness from laboratory analyses that reveal either an elevated or reduced level of something in the blood, often caused by an intrusion from the outside. Thus, illnesses or diseases were and still are coined in terms of either a lack or an excess of something in the patient, and pathology became a deviation from the standard. For example, a person suffering from diabetes has elevated levels of blood sugar. Even if the person has all the symptoms of someone suffering from diabetes, without an abnormal level in the blood the patient will not be diagnosed with diabetes.

To establish whether, for example, blood-sugar levels are too high or too low, norms were needed. Physiology, the new science that arose in the nineteenth century,

[2] I will be referring to two books. The first was published integrally in 1966 in French and translated into English in 1978. Part one was originally published in 1943 and constitutes his doctoral thesis, 'Essay on some problems concerning the normal and the pathological'. Part two was written between 1963 and 1966 and is called 'New reflections on the normal and the pathological'. When I refer to this book, I will use 1966 as the date of publication. Referring to page numbers, I will add 1989, the printed copy of the book I used, published by Zone Books. The second book contains selected writings from Canguilhem edited by François Delaporte, published in English in 1994.

aimed at precisely that: establishing norms for the 'normal' function of living things. The way to go about this had been paved by the work of Adolphe Quetelet (1796–1874), the father of biometry who used the *Gaussian* or *Normal* distribution to justify the use of statistical averages and the deviation from it. The statistical mean, obtained from empirical research, is equated with the norm and the more a characteristic deviates from this statistical norm, the rarer it becomes. With respect to the goal of my paper it is important to emphasize that Quetelet explicitly claims that the statistical mean has ontological status, the statistical mean does represent something real in the world (see Canguilhem 1966/1989: 158).

Before discussing the problems with the definition of pathology or disorder as an attribute whose value deviates sufficiently from a norm, we first need to establish what allows for a proper or valid measurement. This will appear to be particularly important with respect to psychiatric of psychological concepts.

3.3 Valid Measurements

3.3.1 Measuring Physical Phenomena

To assess some attribute, we need a valid tool or test. The example of the thermometer will serve as an illustration to define the characteristics of a valid measurement. A thermometer is a tool that measures the temperature of a body (e.g., the environment, a gas, the bathwater, an organism, etc.). To measure the heat or hotness of a body, physicists rely on a theory with respect to heat and energy. The assumption in the development of thermal physics is that bodies consist of molecules and these molecules move or vibrate. Three important implications are drawn from this: (1) the speed with which the molecules move can vary, (2) the movement of the molecules contains energy, called kinetic or thermal energy, and (3) bodies with higher kinetic energy (the hot body) can release their energy to bodies with a lower level of kinetic energy (the cold body). Figure 3.1 represents an example of a hot body (black molecules) next to a colder one (striped molecules). One additional fact is required to understand the workings of a thermometer, namely, bodies, particularly visible in liquids, expand when kinetic energy is added to the body.[3]

Assume that the black molecules represent the temperature of the body to be measured. The striped molecules represent the thermometer (also a body). When the thermometer is placed next to the body of which the temperature has to be assessed, the body with the highest kinetic energy (the hotter one) will release its energy to the one with the lower level of kinetic energy (the colder one), until they both have the same level of kinetic energy. When the kinetic energy of a body increases – in the case of a thermometer the body is usually a liquid (mercury or

[3] This knowledge is expressed in the first law of thermodynamics: P*V = n*R*T. The pressure (P) of a body multiplied by its volume (V) is proportional to the amount of gas (n) multiplied by the gas constant R and its temperature T.

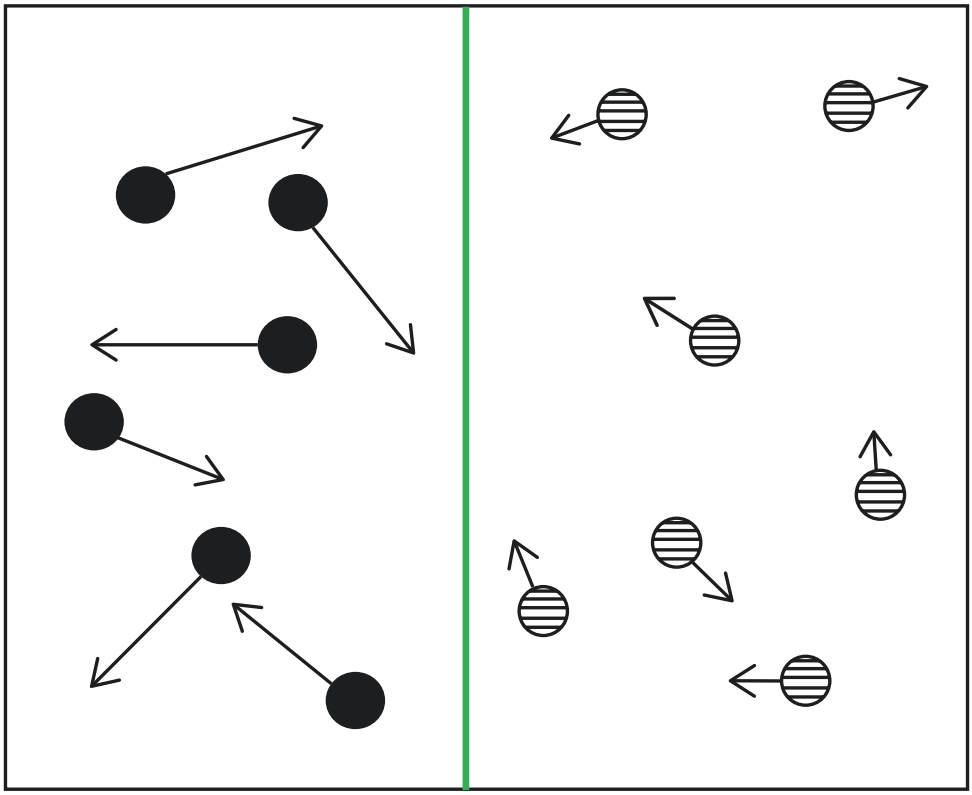

Fig. 3.1 Vibrating molecules in which the *right panel* is the thermometer and the *left one* the body to be measured

alcohol) – the liquid will expand and take up more volume. This is visible in the rise of the liquid in the tube. The more the liquid in the thermometer rises the more kinetic energy is transferred from the measured body to the thermometer. When the liquid stops rising (or falling for that matter), it means that the average kinetic or thermal energy of the two bodies is identical and we have an indication of the temperature of that body.

Of course, we need a calibration procedure to be able to obtain norms for the amount of kinetic energy (i.e., the temperature) of measured bodies. A well-known thermometer is the one developed by the Swedish astronomer Anders Celsius in 1742. Celsius has set the melting point of ice at 0 degrees and the boiling point of water at 100 degrees. Within this range, the increase in temperature develops more or less linearly. Dividing the length of the tube in 100 equal steps makes it possible to measure temperatures according to shared norms. The fact that more than one type of thermometer was developed does not threaten the validity of our measurement tool (e.g., Celsius, Fahrenheit, Réaumur, Kelvin). After all, scores on each of these measurement devices can be transformed into one another, which evidences that the norms of the different thermometers are related to some fundamental underlying principle.[4]

[4] To compute the reading of a Fahrenheit thermometer into Centigrade we take the measurement of the Fahrenheit thermometer, first withdraw 32 from it, and then multiply this number with 5/9.

At this point, I need to point out an important caveat that I will return to later: the temperature reading of the body is in fact the reading of the kinetic energy of the body combined with that of the thermometer, the measurement device. Before the thermometer was put next to the body, the body did not release energy to the thermometer. To be able to obtain information from the body, it has to do so. This means that if the body had a higher temperature than the thermometer, the reading will be slightly too low. This loss of information will be negligible in case of measuring the temperature of water in a bathtub or that of a human body, but not when we want to measure the temperature of a drop of water with a regular household thermometer. The essential point taken from this is that measuring something is intervening in the process at hand. Thus, a measurement or a score is always the result of the interaction between the entity, phenomenon, or process we are interested in and the measurement device. At macro-scale physical levels, this interaction usually does not create problems, but it does on micro levels, such as in quantum physics.

This example from physics reveals that once we have some kind of recognition of an attribute out there that needs to be measured and a theory of what is actually happening between the attribute and the measurement or the test score (in this case the transfer of kinetic energy and the fact that bodies expand when their kinetic energy increases), we are able to make sense of test scores (i.e., the reading of the thermometer).

Consequently, the construction of a measurement device depends on knowledge of the workings of the phenomenon to be measured. My elaborate discussion of how temperature is measured was inspired by the seminal work of Borsboom et al. (2004) on the concept of validity. Their definition reads:

> A valid test can convey the effect of variation in the attribute one intends to measure. This means that the relation between test scores and attributes is not correlational but causal. A test is valid for measuring an attribute if variation in the attribute causes variation in the test scores (p. 1067).

This is exactly what a thermometer does. There is an attribute, namely kinetic energy. The amount of kinetic energy is causally related to the reading of the thermometer (test scores), because the amount of kinetic energy is proportional to the score on a thermometer. Moreover, Borsboom et al. (2004) use of *validity* coincides with that of most social scientists, namely, a valid test measures what it is supposed to measure. Thus, there exists an attribute in reality (ontological claim), which reveals the effect of variation of the attribute (there is a referent), because the attribute causally affects the outcome of the measurement protocol (hence it is not based on correlation, but on causation).

3.3.2 Measuring Psychological Phenomena

What does this mean if we want to measure disorder or pathos or just some psychological phenomenon? We need to be sure that the attribute we want to measure does in fact exist. We also need a theory to explain the variation in test scores that can be

ascribed to variation in the attribute and we need a tool that is capable of picking up on the variation of the attribute to be measured. The ontological claim as well as the corresponding conclusive theory is precisely what is lacking in all tests developed in psychology and psychiatry.

Take for example the widely used intelligence test. Its statistical construction provides the percentile rank, based on standard scores, of the one who took the test. A percentile rank is an indication of the percentage of people of a particular age group who scored lower on that test than this particular individual. For instance, an IQ of 120 means that 91 % of the age group scores lower and an IQ of 65 means that only 1 % scores below that level.

The first question that needs to be answered is whether or not intelligence exists. What is its ontological status? For that we need a theory. Unfortunately, there is no consensus on intelligence and although many test developers maintain they have a theory of intelligence, I dare to say that they are confusing description with theory. The examples that follow are taken from Kaufman's second chapter (2009). Binet and Simon stated that intelligence consists of three different aspects: direction, adaptation, and criticism. Guilford defined intelligence in terms of three dimensions: (1) intellectual[5] processes required to solve a problem, (2) the content of the problem, and (3) the products or how stimuli are organized. The most interesting one is provided by David Wechsler, developer of the 'Wechsler Intelligence Scale for Children' (WISC). His definition of intelligence, as we will see below, closely resembles Canguilhem's concept of health: intelligence, he explains, is "…a person's overall capacity to understand and cope with his or her environment" (Kaufman 2009: 43).

Another indication of the limited theoretical value of the concept of intelligence is the fact that many different intelligence tests exist (WISC, WAIS, Stanford-Binet Intelligence Scale, Woodcock-Johnson III, Raven, K-ABC, etc.) and scores on these tests do not necessarily coincide. Kaufman (2009: 152) reveals differences in scores of up to 22 IQ-points obtained by one participant, which amounts to being evaluated as having above average IQ on one test and below average on the other. Unlike the thermometer, different intelligence tests do not provide identical IQ-scores. The argument that measurement error should be taken into consideration is not an acceptable explanation, because thermometers also produce measurement errors. Based on a sound theory, it can be argued that thermometers as well as sphygmomanometers (devices that measure blood pressure) are causally related to their respective test scores, whereas IQ and reading skill are only correlationally related to a test score.

After this exposé on the difference between attributes that are believed to be real (or at least for the existence of which we find evidence) and attributes that are questionable, another equally important issue requires discussion. Suppose it was possible to measure psychological phenomena validly (after all, there are numerous scientists who claim they can, given the ever-increasing number of 'acknowledged'

[5] Note that Guilford uses the word intellectual as part of the explanation for intelligence. Using the attribute to be explained (explanandum) in the explanans is logically invalid.

psychological tests), then the question arises *why* and based on *what* are we deciding that some value of a measurement is too high or too low. In the end, the question that needs to be answered in the context of this chapter is: How are we able to assess that psychological and for that matter psychiatric phenomena deviate sufficiently from some standard in order to call them a disorders or disabilities? I discuss these issues in the next paragraphs.

3.4 Normal and Abnormal

When measuring temperature, mass, or distance, we attribute some number in predefined units (centigrade, kilogram, and meter, respectively) to the body or process of interest. There is nothing in the number on a thermometer, speedometer, or scales that indicates that the score is too high or too low; it just provides a number. It is the human observer who appraises its meaning. Appraisal is always contextually bound, *too high* is always too high with respect to something. A car (body of interest) that drives at a speed of 120 km per hour is too fast on a road with a speed limit of 100 km per hour (given that the driver tries to avoid a fine), and too slow on some stretches of a Formula One race circuit (given that the driver wants to win). In other words the number is always appraised or evaluated with respect to the context and the goal. There are no inherent norms in proper measurement devices.

What about psychological measurements? Let us return to the IQ-test. The score on an IQ-test is not based on some pre-defined unit of measurement. The number that results from administering an IQ-test is based on the results of a large group of people with a certain age who took the test at some point. Thus, the reading of an IQ-test is the result of some-pre-established norm that constitutes the test. The norm is the average score on the test (for which there is no real entity or theory that links the test score with some attribute) and scores below or above average are considered deviations. The IQ-test, in fact all psychological tests, have their norms built-in. The scores only reveal the ordering of people with respect to one another. Note that ascertaining deviations from the norm, which are used to argue that a person with an IQ-score way below average is not eligible for regular education, is the second step in the normative process of evaluating people, not the first.

The fact that all psychological tests are based on statistical values, usually averages, is not necessarily a problem if their purpose is, for example, that we want to find the best person for a task (provided that the test measures what it is supposed to measure). However, most psychological tests are used to assess whether someone deviates too much from the average, and this assessment is used to deem the person abnormal[6] for that particular psychological trait or disposition. Unlike in the case of speed, where the number that results from the test has to be appraised in the context of the situation, the result from a psychological test is the appraisal itself. Therefore,

[6] Note that I use the word abnormal here because of its meaning ‘departing from the normal’ similar to Canguilhem’s (1966) usage of the term.

psychological testing is a normative act without taking context into consideration.[7] All so-called standardized tests come with norms by which to assess the outcome. The Child Behaviour Checklist (CBLC; Achenbach 1991) for the identification of problem behaviour in children determines whether the child's score reveals normal, borderline, or clinical behaviour; the latter being the pathological condition.

3.4.1 The Etymology of Normal

Normal in the sense used in psychological tests apparently reveals healthy behaviour. But to what extent is the origin of the word *normal* related to health? A linguistic or etymological analysis reveals something interesting. The noun *norm* comes from the Latin *norma*, referring to 'a carpenter's square, rule, or pattern', which has been around at least since 1670 in the English written language. *Normal*, thus, is the adjective of norm deriving from the Latin normalis 'in conformity with rule' or 'made according to a carpenter's square'. In 1890, normal was first used in text referring to 'usual state or condition' and in 1894 to 'normal person or thing' (Harper's Online Etymology Dictionary).

Note that *norm* and *normal* were originally used to refer to a tool, an instrument that was used by carpenters, the so-called T-square; the reference is an artefact, something rather unusual. After all, one does not find T-square shapes in nature. In that respect one could say that the norm is actually the unusual rather than the usual or common: normal is something that may in fact not exist. Just like, as we all know, the average person does not exist. Of course, a linguistic analysis of the developing concepts of *norm* or *normal* does not necessarily discredit its current-day usage. It is nevertheless revealing that *normal* used for people has something to do with shaping people into some prototype, which the T-square is. The emergence of equating normal with healthy may originate from *normal* meaning 'usual state or condition', assuming that health is the usual condition. The fact that health is a desired condition does not, however, guarantee that it is usual.

Establishing normality or health based on (standard) deviations from a statistical quantity such as the mean or modus does not provide us with an objective measure of the condition of a person. There are many situations in which deviations from the norm are not viewed as unhealthy. Take for instance a high score on an intelligence test. A score of three standard deviations above the mean is considered a rather 'healthy' albeit abnormal intelligence. Only when the IQ-score is substantially below the mean, will it be considered an abnormal, unhealthy score.

Why is a high score on an IQ-test considered healthy, despite it being abnormal, and a low score, abnormal and unhealthy? A high IQ often provides the individual with more and better opportunities in life, whereas a (very) low IQ is often the fore-

[7] The fact that the context, people of a certain age taking the test, was used to establish the norm does not invalidate the argument that the result is interpreted as an 'objective' context-free measurement.

bode of a difficult future usually requiring long-term care. The qualification 'often' reveals that people with high IQ's do not necessarily lead healthy lives and those with low IQ's unhealthy. There are numerous exceptions. In fact, the literature on giftedness demonstrates quite clearly problems that people with high IQ's may encounter (e.g., Seeley 2004). Like in medicine, the statistically abnormal may be healthy, and the statistically normal can be sick (e.g., 70 % of a population may contract the flu). An example is 'Dyschromic spirochetosis'. This condition is characterized by coloured spots on the skin and was so prevalent in the South American Indian tribe Pinta, that those who did not have the spots were considered sick (pathological) and could not marry (Sedgwick 1972). Although a fever is relatively unusual, it is at the same time a healthy response to something that went wrong, because the reaction of the body to increase the temperature enhances the immune system. In sum, to equate health with normal in the statistical sense does not appear to be a fruitful direction, not even in medicine,[8] because deviations from statistical averages may never lead to problems, may lead to problems in some people but not in others, and may also lead to problems in some contexts but not in others.

3.5 Biological Facts and Social Values

If we cannot rely on scientific facts provided by statistics to decide on what is normal and what is abnormal, is concluding that health is an arbitrary norm that serves human preference the only way out? Sedgwick (1972) was probably the most notable proponent of this view. He states that sickness can only be established when we know about an alternative state of affairs that is more desirable:

> In the absence of this normative alternative, the presence of a particular bodily or subjective state will not in itself lead to an attribution of illness. Thus, where an entire community is by Western standards 'ill', because it has been infected for generations by parasites that diminish energy, illness will not be recognized in any individual except by outsiders. The Rockefeller Sanitary Commission on Hook-worm found in 1911 that this disease was regarded as part of normal health in some areas of North Africa (pp. 213–214).

Wakefield (1992, 2006) agrees with Sedgwick that whether a condition is undesirable is based on social values. It does not mean, however, that disorders can be reduced to values, because there are disvalued conditions that we would not think of as a disorder (e.g., poverty or being rejected sexually). Note that he assumes the reader agrees with him on what is to be considered a disorder and what not, prior to

[8] Canguilhem realised that to establish that something is wrong in physiology is not easy. He presents numerous examples of which urinary discharge is a particularly compelling one (1966/1989: 166–167). Chinese people between the ages of 18 and 25 release 0.5 cm^3 urine per minute (ranging from 0.2 and 0.7), whereas Europeans release twice that amount with oscillations between 0.8 and 1.5. These ranges do not even overlap. Canguilhem quotes Bernard (1865) "…a physiologist who took urine from the urinal at the train station through which people passed of all nations, and believed he could thus produce the analysis of average European urine" revealing that he was well aware of problems associated with averaging (1966/1989: 152).

his analysis of the concept. His lucid analysis of the concept of disorder leads him to propose the following definition:

> A condition is a disorder if and only if (a) the condition causes some harm or deprivation of benefit to the person as judged by the standards of the person's culture (the value criterion), and (b) the condition results from the inability of some internal mechanism to perform its natural function, wherein a natural function is an effect that is part of the evolutionary explanation of the existence and structure of the mechanism (the explanatory criterion) (Wakefield 1992: 384).

The important as well as most difficult concept in his view is 'natural function'. His analysis follows that of artefacts: a pencil's function is writing, the heart's function is to pump the blood around in the body, the function of language is communication, and the function of fear is useful for avoiding danger. These examples reveal a mechanistic view on (mental) functioning and may be justified by our knowledge of how people manage to survive and procreate. Proper functioning enhances longevity and fertility, which serves as the evolutionary aspect. Thus, talking to oneself as a means to remember a phone number is not a disorder, while 'hearing voices' is taken as a sign of schizophrenia. Note that people with schizophrenia have a reduced chance of offspring (MacCabe et al. 2009).

Although Wakefield's analysis has important similarities with that of Canguilhem, there are fundamental differences between them. They both adhere to the value orientation of disease or disorder. Unlike Wakefield, however, Canguilhem considers the relationship between the person/organism and the environment at the heart of his analysis on pathology rather than as an internal mechanism of the organism that went awry. Canguilhem's analysis reveals, as will be demonstrated below, a complex adaptive systems perspective, whereas Wakefield is a proponent of the mechanistic, information processing approach. I will follow the thoughts of Canguilhem rather than Wakefield for this, for reasons I will not explore further (see Varga 2011, on the untenability of Wakefield's natural function explanation).[9]

3.6 Normative and Pathological

Apart from Spicker (1987), the first substantial treatment of Canguilhem's work in the English-speaking scientific community was a special issue of the journal of 'Economy and Society'.[10] Although Canguilhem's discourse pertains mainly to physical diseases, it is equally applicable to mental disorders as shown by Margree (2002) and Verhoeff (2009).[11]

[9] Although Wakefield mentions the work of Foucault (1965), there is no reference to Canguilhem's analysis of the pathological in any of his works.

[10] The special issue of 'Economy and Society' (Osborne and Rose 1998) was the result of a conference held in London in 1996.

[11] I hasten to state that the distinction between the physical and the mental or psychological is just made for convenience. It remains to be seen whether it will hold up. An ontological distinction is certainly doubtful (see e.g., Sedgwick 1972; Wakefield, and many others in the journal of *Philosophy, Psychiatry, & Psychology*).

To understand Canguilhem, it is necessary to explain his view on science. He makes a fundamental distinction between the science of the non-living world (physics, mathematics, chemistry) and the life sciences (i.e., biology, the mother of the study of living organisms). Non-living sciences are value-free. It does not make sense to ask whether it is good or bad for a number to be a prime or whether redox reactions are healthy. Thirteen is a prime number because of the definition of primes and $4Fe + 3O_2 \rightarrow 2Fe_2O_3$ is a chemical reaction that describes the rusting of iron; both are simple value-free facts of reality. This is not the case with respect to biology.[12] In the living world, life may go wrong (Canguilhem 1966). Thus, organisms may be in situations that are good or promoting life and circumstances that are bad or detrimental to their survival.[13] The meaning or value for the organism in a given situation, that is, the organism-environment relationship, is a normative activity.

Healthy organisms are able to follow existing norms to maintain life given the existing circumstances. Healthy norms are dynamic (i.e., they change over time), because they display sufficient degrees of freedom to adapt to the environment and impose their normativity on the environment in return. Not being able to tolerate change is a sign of pathology, according to Canguilhem. Catching the flu and recovering from it is a sign of health. "Haemophilia is more of an anomaly than a disease" (Canguilhem 1966/1989: 140). Because people with haemophilia have to interact with the environment, this entails a risk of injuries, and thus the anomaly may turn into pathology.[14] With respect to psychiatric 'diseases', we have to ask ourselves whether a child who is restless and fidgety (conclusion based on being unable to sit still in her seat, roaming around the room, tapping and touching objects continuously) does in fact have ill health or to put it in psychological terms, suffers from Attention Deficit Hyperactivity Disorder (ADHD).

Recall that calling something unhealthy or a pathology implies that the organism is unable to adapt to change in order to maintain life. In my understanding, Canguilhem would never view ADHD-behaviour as pathological, because being restless and fidgety does not mean that one is unable to maintain life. ADHD-behaviour is another way of being, it is another order, but it is nothing more than that. Baron-Cohen (2008) has a similar view on autism and Asperger syndrome,

[12] Canguilhem (1966/1989: 136) nicely illustrates this as follows: "… the history of anomalies and teratology are a necessary chapter in the biological sciences, expressing the originality of these sciences – for there is no special science of chemical and physical anomalies…"

[13] Without getting into detail, I would like to raise a caveat about the fundamental difference between living and non-living things. The second law of thermodynamics states that the entropy of any isolated system not in thermal equilibrium almost always increases. In laymen's terms, physical systems have a natural tendency to become increasingly disordered. For example, gravel, the result of the erosion of rock, will not spontaneously return to rock again. For this to happen, energy has to be added to the system. Thus, rock and for that matter *all matter* is 'going wrong', because in the end all matter ceases to exist (cf., die). Note also Canguilhem's statement (1994: 117–118), "…one can still say that living things are systems whose improbable organization slows a universal process of evolution toward thermal equilibrium – that is, toward a more probable state, death."

[14] People with haemophilia have problems with the clotting of their blood, characterised by spontaneous bleeds or longer bleeding after an injury.

which he considers a *condition* rather than pathology (see also Hens in this volume on the issue of neurodiversity). People who are diagnosed with autism have a strong systemizing mind rather than the more prevalent empathizing mind (see also Grandin 2012).[15] A person who finds an environment that suits and promotes her behaviour is perfectly healthy. Because current practice in medical and social circles demands from people to conform to the statistical normal rather than to the biological normative, many children and adults are diagnosed with pathologies for conditions that Canguilhem would not consider to be a pathology at all (see, for a similar discussion, Giordano in this volume on healthy and pathological sexes).

Healthy organisms can also create new norms that enhance survival. A painter who loses both arms and learns to eat and draw with her toes has constituted a new norm for herself as an organism, one that is beneficial to her life. To still consider her to be in ill health is at odds with the analysis provided by Canguilhem. Witty Ticcy Ray in Sack's (1985) famous book 'The man who mistook his wife for a hat', is another example of someone who turns his condition, Tourette's syndrome, into the best of both worlds. During the week he takes Haldol to conform to normal, daily life, whereas in the weekends he is off the drug and uses his frivolous, frenetic, creative self to fully enjoy his musical gift as a jazz drummer. This way, Witty Ticcy Ray created alternative niches to lead a 'healthy' life.

Finally, healthy organisms can also change and impose new norms. Improving hygiene advances longevity. Enhancing longevity is a value judgment, because average life span is not a biologically normal given, but the socially normative. Another example is the change in smoking behaviour. Until the sixties, smoking was fully acceptable (at least for men). After science revealed the relationship between lung cancer and smoking, a steady decrease of smoking and its acceptance became apparent. Classical music used to be played in a tempo half of what it is now. At the end of the nineteenth century, new norms were successfully imposed by those with fast, technical brilliance (Wehmeyer in Honoré 2004). A current educational example is provided by the Finnish authority. The country's board of education states that typing is going to be far more useful than cursive writing, and it will therefore remove cursive writing from primary education's curriculum (Kerin 2015). Cursive writing used to be an important skill, hence a value, for professional development, but it is expected that being able to type fluently will be more important in the future. Again, good typing skills are not the biologically normal, but the socially normative.

Being able to create and impose new norms is also a sign of health.

> A living being is normal in any given environment insofar as it is the morphological and functional solution found by life as a response to the demands of the environment. Even if it is relatively rare, this living being is normal in terms of every other form from which it diverges, because in terms of those other forms it is normative… (Canguilhem 1966/1989: 144).

[15] Temple Grandin (2011) states that if autism had been eliminated, mankind would still be standing around in a cave, chatting and socializing and not getting anything done.

An anomaly (e.g., a mutation) can never in itself be pathological or normal; it expresses other potential norms for life. To establish normality in a laboratory cannot be a solution either, because it denies the fact that this is one of the many possible environments, one that is different from a natural situation (Bosman et al. 2013). Thus, nothing in itself can be pathological, because what is adaptive in one circumstance may prove to be maladaptive in another (see the current discussion on ADHD viewed from an evolutionary perspective, Matejcek 2003). In the next paragraph I will elucidate why Canguilhem's analysis of health and pathology is a clear example of a complex adaptive systems perspective.

3.7 Canguilhem and Complex Adaptive Systems Theory

A central and controversial concept in the work of Canguilhem is *vitalism*. This concept has been taken to mean that life is ontologically different from the non-living (see Greco 2005; Lecourt 1998; Verhoeff 2009 for a discussion). With Gutting (1989), I believe that this interpretation of Canguilhem's concept of vitalism is incorrect. Gutting's analysis paraphrasing Canguilhem reveals this quite clearly:

> In the sense that vitalism tried to reject the application of physics and chemistry to organisms, it was an obstacle to scientific progress. But, in another sense, vitalism was – and remains – a salutary reminder that, even if physico-chemical laws are fully applicable to organisms, vital phenomena still have distinctive features that exclude any facile reduction of them to inanimate systems (Gutting 1989: 41).

After all, "The laws of physics and chemistry do not vary according to health or disease" (Canguilhem 1966/1989: 220). Rather than accusing Canguilhem of holding an unscientific viewpoint, it seems more appropriate to argue that Canguilhem was way ahead of his time. In many parts of his work, we find clear manifestations of a *complex adaptive systems* thinker avant la lettre.

Complex adaptive systems (a concept first coined in 1984 by scientists from the Santa Fe Institute; Waldrop 1993) are systems such as organisms, immune systems, brains, insect colonies, and stock markets. These systems are able to learn and can adapt to changes in the (internal as well as external) environment. The properties or the behaviour of complex adaptive systems are emergent and cannot be deduced from the components that constitute the system. In his work published in 1943 Canguilhem acknowledges the characteristics of adaptation and emergence, when he talks about diabetes:

> …it is not a kidney disease because of glycosuria, nor a pancreatic disease because of hypoinsulinemia, nor a disease of the pituitary; it is a disease of an organism all of whose functions have changed […]. It seems very artificial to break up disease into symptoms or to consider its complications in the abstract. What is a symptom without context or background? What is a complication separated from what it complicates? When an isolated symptom or functional mechanism is termed pathological, one forgets that what makes them so is their inner relation in their indivisible totality of individual behavior (Canguilhem 1966/1989: 88).

Canguilhem was a great admirer of the psychiatrist and neurologist Kurt Goldstein (1878–1965) who stated that "If the organism is a whole and each section of it functions normally within that whole, then in the analytic experiment, which isolates the sections as it studies them, the properties and functions of any part must be modified by their isolation from the whole of the organism. Thus they cannot reveal the functions of these parts in normal life" (Goldstein 1940/1951: 10). This quote shows Goldstein's holistic approach to biology, which Canguilhem accepted as an important aspect of his view on pathology, organisms, and life in general.

A final example of Canguilhem's approach that is reminiscent of complex adaptive systems is the following: "An organism's behavior can be in continuity with previous behaviors and still be another behavior" (1966/1989: 87). Although there may be a continuous increase in quantity, this does not imply qualitative identity (see also Margree 2002). An example is water that is heated up. The kinetic energy that is transferred from the fire to the water increases continuously and does not show any visible change in the behaviour of the water between 65 and 66 until it changes from 99 to 100 degrees Celsius, despite the fact that the temperature in both cases only increased by 1 degree. The continuous change of the control parameter 'kinetic energy' causes a change in the behaviour variable after it crosses a threshold value. Water atoms in a liquid constitute an order different from the order in a gas. (Physical) Disease may occur when a pathogen has reached a particular, individual threshold. The order of the sick organism is qualitatively different from the order it had when it was healthy. Illness is therefore *order* and not disorder. Being ill is being different from being healthy. Different orders have different norms and that is why these conditions are value-laden.

3.8 Pathos, Values and Responsibilities

Being ill or having a disorder implies *pathos* according to Canguilhem, it is "… the direct and concrete feeling of suffering and impotence, the feeling of life gone wrong" (Canguilhem 1966/1989: 137; italics in original). In a quote of Leriche he emphasizes the *suffering* aspect: "disease is what irritates men in the normal course of their lives and work, and above all, what makes them suffer" (Canguilhem 1966/1989: 91). Hence, pathos or suffering is an important, albeit not sufficient, aspect of pathology.[16] Canguilhem agrees with Goldstein that a pathological norm is above all an individual norm. This implies that it is mostly the individual who decides whether she is ill or has regained health pertaining to somatic and psychological anomalies alike.

Although the pathological norm is an individual one, it does *not* mean that pathology is localised *in* the individual (or *in* the environment for that matter). Pathology, as explained above, is the diminished capacity of the organism in that

[16] Suffering is not a sufficient condition, because a healthy person may suffer during an illness. Being ill is not necessarily a pathology; recovering from an illness is a sign of health.

particular environment to conform to existing norms (i.e., to make life profitable for survival or pleasurable). In other words, pathology emerges when organism A in environment B is unable to conform to norm C. Because pathology is an emergent property of the relationship between the organism and its environment, a pathology or disorder cannot be assigned to a characteristic of the organism *or* the environment. An emergent property[17] means that the property cannot be reduced to the assumed components that gave rise to it. With respect to pathology and disorder this can only lead to one conclusion, namely, that it is incorrect to state that person A has disorder X.

If the above makes sense then it will not come as a surprise that Canguilhem does *not* consider medicine to be a science. Physics is a science, but medicine, like psychiatry, or clinical (child) psychology (also known as orthopedagogy in the Netherlands) is not, because the client's[18] experience, that is, suffering, cannot be reduced to scientific objectivity. In Canguilhem's words: "… the life of the living being, were it that of an amoeba, recognizes the categories of health and disease only on the level of experience, which is primarily a test in the affective sense of the word, and not on the level of science. Science explains experience but it does not for that annul it" (Canguilhem 1994: 356). He views medicine,[19] and for that matter all disciplines concerned with restoring 'health', as "…a technique or art at the crossroads of several sciences…" (Canguilhem 1966/1989: 34). Clinical practice will never be a science, despite the fact that its methods are effective as a result of science, because science cannot dictate norms to life (Trnka 2003). To be more concrete, the goal in medicine is to provide a therapy or cure to diminish suffering or restore health. Despite the 'scientific fact[20]' that a daily dose of morphine alleviates many pains rather effectively, doctors will not use this type of medicine unless there is no other option, because of its highly addictive property. In clinical practice, a doctor needs to weigh the pros (pain reduction) and cons (drug dependency) when prescribing a medicine. Because pros and cons represent different norms, science can never provide the answer.

Assessing suffering and providing treatment are the prime goals of the clinical disciplines. Current practice of the assessment of an individual's problem requires diagnostic tools. As I showed earlier, most tests in the medical discipline, such as thermometers and sphygmomanometers, are valid tools, whereas psychological tests are not. Note that despite the use of valid instruments, diagnoses in medicine are nevertheless value-laden. It is we who decide that a certain blood pressure needs

[17] O'Connor and Wong (2012) use a generic definition: "Emergent entities (properties or substances) 'arise' out of more fundamental entities and yet are 'novel' or 'irreducible' with respect to them."

[18] In all of psychology (and also sometimes in psychiatry) the term client is used rather than patient, contrary to the usual choice of terms in medicine. It shows, and that is another interesting aspect, that somehow being *psychological ill* does not mean that one is a patient as in being *physically ill*.

[19] Medicine means 'the healing art' (www.etymonline.com).

[20] A scientific fact indicates here that it has not only been proven that opium has this capacity (something we knew all along), scientists also claim to have found the mechanism of how the substance works in the body.

to be treated, because its level is considered unacceptable. An unacceptable level is a value statement, irrespective of whatever (good) reason. Apart from the fact that psychological tests are not valid, because they lack all of the requirements put forward by Borsboom et al. (2004), further analyses revealed that all psychological tests have normativity built-in.

I have also explained that taking a measurement establishes a relationship between what measures and what is measured. In terms of psychology, the test, the diagnostic, and the 'client' constitute an irreducible whole. Any evaluation (i.e., diagnosis) is always the result of the relationship between client and clinician (potentially with measurement tools). Assessment is an intervention and this intervention changes the relationship of the client with the environment (which includes the diagnostic). A clinician cannot withdraw from this relationship to assess the client's behaviour/suffering. This is not just practically impossible (someone has to interact to establish something), it is also practically unavoidable. The relationship between organism and environment provides the stage for diagnosis and treatment and this relationship is inherently normative.

If a disorder, preferably *different* order[21] (for reasons explained above), is an emergent phenomenon, it calls for a description in terms of the relationship between the individual and her circumstances. This means that those who are dealing with people in need should appraise the relationship rather than its components, the organism or the environment. Hence, simply checking characteristics listed in manuals like the DSM does not lead to a 'valid' evaluation of the situation, because of the emphasis on the individual rather than on the relationship. Canguilhem's analysis of pathology or disorders provides people who look after children, such as parents and other caretakers and those who are engaged in the wellbeing of individuals in need, with a huge responsibility. This responsibility requires a thorough reflection of the situation of people who suffer.

What does my analysis entail for the current situation in many countries in which there is no help without an official DSM-diagnosis? People who suffer, but whose suffering cannot be reduced to one of the many official labels, will not be eligible for financial compensation even when they feel that treatment is required. This policy is to a large extent the responsibility of the scientific community who made policy makers believe that we can truly distinguish between the normal and the not-normal. One does not need to dig deep to see that the DSM is not based on scientific facts, but on politics. Interest groups whose suffering was not officially recognized have sometimes lobbied successfully for recognition (e.g., post-traumatic stress syndrome by Vietnam veterans; DSM-III), whereas other interest groups were successful in removing a disorder from the DSM (e.g., homosexuality was fully discarded from the DSM-IV). A quote from Lucy Johnstone's book (2000, see Rowe 2010) endorses my analysis, "To admit the central role of value judgments and

[21] In a similar vein is the suggestion of Bettinger (2015) who uses the term 'signal' behaviour rather than 'problem' behaviour. The former is not just less evaluative, it also refers to communication that underlies all (human) behaviour, which in turn emphasizes the relationship between client and caretaker.

cultural norms [in the creation of the DSM] is to give the whole game away. The DSM has to be seen as reliable and valid, or the whole enterprise of medial psychiatry collapses."

Because the DSM cannot provide a valid diagnosis, its use only provides a pseudo-ontological status for which the scientific community has to take full responsibility. Parents, caretakers, and clinicians need to recognize that suffering is at the heart of the problem, not being different. The fact that a child or adult has the DSM-diagnosis 'Autism Spectrum Disorder', which is viewed as a lifelong affliction, provides the individual support and financial compensation. But, someone who is diagnosed with autism may or may not suffer, just like someone who contracted poliomyelitis may suffer or not.

A person in need is a person in need in a specific time and place, with its unique history in relationships with significant others and the clinician (i.e., circumstances). And, because circumstances as well as the organism are continuously changing (life is not static, otherwise it would not be life), the needs of care-dependent people require continuous attention, that is, monitoring over time. But above all, they require a parent, caretaker, and clinician to always reflect on the norms that come with our perceptions of (diagnoses), and actions on (interventions), care-dependent people. Scientists and politicians may need to reconsider the established values of health and disease.

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