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Systems Evolution via Communicative Transference: An Examination of Legal Adaptivity to Neurology Within the District Courts of Sweden.

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Abstract

The purpose of this paper was, via broad application, to empirically test and examine the theoretical framework of communicative transference, as proposed by Broström (2023a). The paper aimed at studying the transfer of communication taking place between medical and legal systems, with a specific focus on the defendants' neurological circumstances within the district courts of Sweden, during the period 2012-2022. The paper made use of a mixed method sequential explanatory design of QUAL-QUANT-QUAL progression, utilizing nested analysis of Large- and Small-N data. The data was composed of a systematic literature review (N=33), Large-N data of legal cases for statistical analysis (N=150), and Small-N data of legal cases for in-depth analysis (N=2). The paper found empirical support for legal systems becoming more accepting of, and willing to adhere to, communication from structurally coupled sources which themselves adhere to a judiciary-oriented language in their communication of neuromedical facts. The primary conclusion of the paper was that the extent to which the district courts of Sweden are adhering to neuromedical communication is lower than desired, but that the courts' adaptivity is greater than expected. Systems evolution, i.e., adaptivity to intrasystematic communication, can be understood and argued as the outcome of communicative transference.

Keywords: Communicative Transference, District Court, Medical-Legal Systems, Neuroscientific Evidence, Systems Theory.

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Systems Evolution via Communicative Transference:
An Examination of Legal Adaptivity to Neurology Within the District Courts of Sweden.

This paper is the continuation, and culmination, of two prior theses in Criminology and Psychology, both of which reviewed the topic of *neurology in law*. The initial thesis in Criminology, named: *Recidivism: A Luhmannian perspective on neurosocial influence underlying action* (2021), was *theory generative* and made the point to argue that individuals can be perceived of as biopsychosocial *systems*. These systems, could in turn be understood as segmented and differentiated into three parts (subsystems) pertaining to the organic, psychic, and social (Ibid., p. 22). The organic subsystem could be further differentiated into cells, organisms, and even the brain, whereas the psychic subsystem could be divided into volition, emotion, and cognition. Similarly, the social subsystem could be divided into societies, organizations, and interactions (Ibid., p. 23). The thesis argued, on the basis of its individuals-as-systems presupposition, that the question of highest interest was *how* each of the subsystems of the individual could be understood as being able to *communicate* with one another. And so, in arguing that all systems have the capacity to generate *irritations* within their surrounding environment, and that recipient systems can engage with deontologization, i.e., the deconstruction of an irritant to investigate whether or not any components of the irritant (or the irritant as a whole) can be incorporated into the observing system (Ibid., pp. 25-27) – an *interval of relative success in communicating* with other systems could be observed. This in turn provided an explanation for, and as an example, how a stressful situation at ones workplace (social system), might affect ones psychological well-being (psychic system), which might cause a stomachache in the mornings due to an unwillingness to go to work (organic system); which is known as a psychosomatic reaction (Ibid., p. 29). However, and as noted in the thesis, because social systems are only able to communicate in a social fashion, i.e., the social system can only reproduce social actions, the psychic system is similarly only able to communicate psychically, and the organic system only being able to communicate organically; a presumption as to the relative communication was made by introducing the concept of *communicative proxy* (Ibid., pp. 29-30). This proxy exists as a boundary concept which surrounds and separates systems and subsystems from their surrounding environments, ensuring that no undue influence is made within the system. And so, the only way for communication to be incorporated into a system, is by means of differentiation and structural coupling. This meant, in accordance with Luhmannian theory, that the systems themselves possess the capacity to observe irritations, deontologize irritants,

and assess whether or not an irritant's components, or the irritant as a whole, can be incorporated into the observing system, by assessing whether or not the irritant is similar to the internal structure of the observing system (Ibid., pp. 20-22). However, given that the communication exists on an interval of relative success, this also implied that despite the willingness of, for instance, a social system to communicate with an organic system, a complete transfer of communication might not be possible. This idea, of communication existing on an interval of relative success when transferring communication between systems, was what led to the second thesis: *'The Self' in Law, Psychology, and Neurology: Understanding the Communicative Transference of Neurocognitive Impairments* (2023a).

The second thesis was in turn *theory building* and *theory testing* by nature, given that it explored the *issues* of transferring communication between, as well as within, systems, by making use of neurocognitive impairments and investigating how they are conceptualized, communicated, and understood by professionals within Law, Psychology, and Neurology. The thesis made use of the first documented case wherein pedophilia occurred as a specific manifestation of orbitofrontal syndrome (Burns & Swerdlow, 2003) – and asked several professionals from within the fields of Law, Psychology, and Neurology, *how* they understood and conceptualized such an occurrence within their respective fields, as well as how they would communicate their understandings and conceptualizations to a court of law (Broström, 2023a, pp. 22-23, 26-37). The purpose of the thesis was thereby to create a framework of *Communicative Transference* by which one might better understand the prevalence of inter- and intrasystematic communicative issues (Ibid., p. 16). As such, the communicative transference framework continued building on the insights and ideas of the initial thesis, and was therefore heavily influenced by Luhmannian systems theory (Luhmann, 1995; Luhmann, 2004; Luhmann, 2012; Luhmann, 2013a; Luhmann, 2013b; Luhmann, 2018) – but also took Wittgensteinian linguistics into account (Wittgenstein, 1992; Wittgenstein, 2021). Of note, as Luhmannian theory exists within a realm of abstractions, providing a theoretical understanding of how systems interact and exchange communication, there existed a fundamental need to couple the abstract with that which could be observed empirically. As such, Wittgensteinian linguistics allowed for a theoretical anchoring to the empirical reality, such that, e.g., a biopsychosocial subject, i.e., the individual, could be understood as a semi-abstract entity in of itself (Broström, 2023a, p. 39). Having created such a synthesis, between select perspectives of Luhmann and Wittgenstein, it became possible to recognize and measure empirical events as expressions of abstract theoretical notions (Ibid., pp. 23-36).

Ultimately, the theoretical framework of communicative transference was created via a synthetization of Luhmannian *deontologization processes* and Wittgensteinian *language games*. This in turn also allowed for a delineation from Luhmannian and Wittgensteinian theory at large, while still incorporating their theoretical aspects into a common framework within which systems were to be understood as *autopoietic*, i.e., self-reproductive, self-referential, and self-preservational, *but* dependent upon *linguistic self-referential interpretations* in their deontologization of observed irritants (Ibid., pp. 4-6).

The deontologization process, as previously discussed, is the process by which an observing system breaks down an irritant, or communication, into smaller components, in order to determine whether or not the components (or the irritant as a whole) can be incorporated into the observing system by means of *differentiation* (Broström & Gewert, 2021, pp. 25-27). Differentiation in turn poses the question: Are the components, or is the entirety of the irritant which 'I' am observing, similar or dissimilar to my internal structure? – A question which embodies that which is called self- and other-referencing, i.e., does it belong to 'me' or to something else (Ibid., pp. 17-20). *If* the observing system recognizes the irritant or its components as being similar (and thereby belonging) to the internal structure of the system, an integration occurs. If not, then the irritant as a whole, or the dissimilar components, are discarded without any further interactions (Ibid., p. 19). The *self-preservational* and *-reproductive* aspects of systems go hand-in-hand in that they strive to remain the same. The self-preservation acts and ensures that the system (for example the legal system), only deals with legal circumstances and thereby *preserves* its own systematic function (Ibid., pp. 24-25). Similarly, the self-reproduction ensures that even though incorporation of irritants from external systems can be made, the deontologizing system only incorporates and reproduces that which is inherent to its own internal structure, i.e., the irritants incorporated into the system share a similar structure to what already exists inside of the system (Ibid., pp. 21-22, 30-31). In summary, the argument that a system is *autopoietic*, means that the system is self-referential, self-preservational, and self-reproductive. As such, and what is left for review with regard to the communicative transference framework, is that of *language games* and *linguistic self-referential interpretations*.

Language games *as part of the communicative transference framework* pertains to the shared conceptual understanding of words and phrases, when used in a particular way to structure sentences, in order to communicate (Broström, 2023a, p. 5). However, the issue underlying language games is that a recipient of any communication cannot, with any amount

of certitude, truly know or understand what the communicatee intended with their communication, as the recipient is only able to *interpret* the communication based on their own pre-existing knowledge (Ibid., p. 6). Therefore, we can only understand the words, phrases, and sentences used within the communication on a surface-level, unless given further explanations as to the meaning the communicatee had intended in using those specific words, phrases, and sentences (Ibid., p. 5). As such, a conceptual link is formed between the language games that one must adhere to in communication *and* the deontologization process of determining belonging. We, as systems, observe the 'irritation' of the communication being made and deontologize its contents. Yet, in the act of differentiation, we find that only parts (or all) of what is being conveyed, corresponds to our internal structure. As such, we are only able to 'attach' and incorporate the deontologized parts corresponding to our internal structure, whereas the remainder of the communication is lost to us (Ibid., pp. 37-38). The linguistic self-referential interpretation can now, through the *language game* that you as a reader and I as an author have engaged with, be understood as the differential process by which one determines belonging based on words, phrases, and sentences in communication, whilst interpreting their meaning against one's own internal structure. Furthermore, and of important note, is the fact that both autopoietic systems as well as language games, allow for the concept of *adaptivity*. As previously mentioned, if given an explanation as to the meaning intended behind a word used by the communicatee, the recipient can incorporate said meaning into their pre-existing knowledge of the word. This is equally true for autopoietic systems, as further communication surrounding the relevance of an irritant can result in the incorporation of certain components, or the irritant as a whole, into the observing system.

Based upon this understanding, the second thesis found strong support in both primary and secondary data to suggest that intra- and intersystematic communicative issues are prevalent and recurring within the fields of Law, Psychology, and Neurology. However, while the thesis concluded that the framework is sufficiently supported to make the claim that it can be used to determine the relative success of communication, it could only speak to the specific case analyzed as part of the study. As such and given that the two prior theses have engaged with *theory generation*, *theory building*, and *theory testing*, *this* paper focuses on the final step in theory creation, namely *broad application.* The broad application of a theoretical framework implies the empirical investigation of *several cases* in order to determine whether or not the theory can describe law-bound regularities with regard to the issues it pertains. Furthermore, and considering that this paper is a continuation of previous theses written on

the topic of *neurology in law*, and as they have provided ample ground for the theoretical framework to grow, it is deemed both advisable and preferable to expand the purview of this paper from a single case, to a multiple case study, in order to allow for the study of neuroscientific evidence within a *system* of law, thereby shedding light on the capability of the framework to describe law-bound regularities.

Purpose, aim, and research question. The purpose of this paper is, via broad application, to empirically test and examine the theoretical framework of *Communicative Transference* (Broström, 2023a) with regard to it being able to demonstrate: 1) communicative issues *within*, as well as *between*, systems, 2) that *frequency of exposure* leads to *adaptivity*, and that 3) *adaptivity given frequency of exposure* leads to greater *adherence*, despite complex transfers of communication. The paper aims to study the communicative transference taking place between the medical and legal field, with a specific focus on the defendants' neurological circumstances within the district courts of Sweden. Given that the purpose of this paper is, via broad application, to empirically test and examine the capability and assumptions of the theoretical framework, the research question has been formulated so as to encapsulate the theory's claims in a single question:

1. *To what extent do the district courts of Sweden experience adaptivity to neurology?*

Hypotheses. In order to answer the research question, three hypotheses have been devised which not only reflect the stated purpose of the paper, but which also reflect the theoretical presuppositions meant to be tested. These hypotheses will in turn guide the paper throughout its investigation and have been formulated as such:

> H1: *The greater the complexity of the communication from an external system, the lesser the degree to which the recipient system adheres to such communication.*
>
> H2: *The greater the frequency of exposure to intrasystematic communication, the greater the adaptivity of a recipient system to new communication from the same source.*
>
> H3: *Systematic adaptivity to intrasystematic communication results in the recipient system being capable of adhering to greater complexity from the same intrasystematic sources, given the frequency of exposure.*

Each of the hypotheses have been constructed in relation to the presuppositions of the theoretical framework. For instance, the first hypothesis demonstrates an expectancy that the greater complexity of communication from an external system, will result in a lesser degree of adherence from the recipient system. This is due to the deontologization process being constructed upon a linguistic self-referential interpretation. As previously argued, when a system deconstructs an irritant into its constituent parts, it determines the belonging of the irritant and its parts with regard to the internal structure of the observing system. Should then the communication be of such complexity, or kind, that the observing system is unable to recognize the words used in the communication, due to the lack of overlapping understanding in the linguistic self-referential interpretation, the observing system would be expected to not integrate the communication. As an example, a judge would most likely have a hard time understanding the legal relevancy of a medical professional discussing the anatomical importance of the endorestiform nucleus, whereas the judge would have an easier time understanding the relevancy if additional information was added regarding the role the nucleus is thought to play with regard to fine motor control. As such, adherence becomes dependent upon the complexity of the communication transferred, when the deontologization process is structured upon the linguistic self-referential interpretation of the observer. Similarly, the second hypothesis has been developed in relation to the theoretical framework regarding the systematic adaptivity which is recurring within autopoietic systems. While the system strives for self-preservation, self-reproduction, and self-reference (which makes it autopoietic), the incorporation of irritants which correspond to the internal structure of the system allows for the system to experience adaptivity as these components thereafter are reproduced within the system. As such, the greater the frequency of exposure to intrasystematic communication, the greater the adaptivity becomes of the recipient system with regard to communication from such a source, communicating such facts. Finally, the third hypothesis was developed using the complete presuppositions of the theoretical framework. All systems which incorporate parts of irritants into their system, generate a fundamental understanding of the irritants' meaning in relation to the internal structure of the system. This in turn allows for greater adaptivity in the self-reproductive process and allows for greater adaptivity in the linguistic self-referential interpretation as a result, leaving the system capable of adhering to greater complexity from the same intrasystematic sources. As a crude example, a student of law would become more adapt at applying and understanding law, the greater the frequency of exposure to legal studies.

PREVIOUS RESEARCH

Language. One of the earliest recorded jury compositions which contained specialists, or experts, was documented in 1351, England. The case pertained to a defendant being charged with selling 'bad food', and the court decided that the terminology of the charge required certain expertise in order to determine what the phrase actually meant. As such, the jury selected was composed of cooks and fishmongers, given that they might better understand the issue (Hans & Saks, 2018, p. 174).

The different languages that judges, lay judges, and juries use, in combination with the issue that these groups have to rely on expert or scientific language in order to reach a legal conclusion, ultimately leaves judicial control out of judicial hands (Gaboardi, 2018, p. 15). This is a prevalent issue within each legal system, i.e., both civil law and common law systems, because expert knowledge and judicial understanding are not overlapping, and so the only way to ensure judicial control is to leave the judging parties without technical and scientific support (Ibid.). However, given the complex and non-rudimentary composition of everyday life for a plaintiff or defendant, this cannot be deemed as an option, and so another path must be identified and taken. In relation to this, Coen & Hefferman argue that the rudimentary language of lay experts, such as that of nurses and clergymen, which is devoid of complex language and expert jargon, is received with much greater acceptance by juries than the communication offered by professional experts (2010, p. 197). A point that is similarly argued by Forret in that judges found it to be of particular importance that experts are able to present their evidence or opinion in *nonjargon language*, or to even use everyday analogies, such that they are able to educate and inform the court of their findings (2004, p. 10). Yet even the transition from field specific terminology and jargon to everyday analogies and language, is not made without issue. Barth, Ryan & Hawk argue that one of the major issues with such a transition is the unintended effect of transforming the probabilistic nature upon which most clinical and scientific conclusions are constructed, into either too a rudimentary comment, or a too absolute sounding legal language (1992, p. 255). As such, and because judges and experts use different languages and approaches in determining the reality of factual questions, legal scholars have attempted to bridge these differences via a structured cooperation (Gaboardi, 2018, p. 1). However, given that lawyers focus on individual decision-making and scientists focus on natural phenomena or general statements, a resolution of structured cooperation is equally problem-fraught, namely because the expert and judge are meant to achieve mutual understanding of their respective specialist knowledge (Ibid., p. 16).

The difficulty of achieving a linguistic cooperation between all parties within the court, irrespective of the legal system within which the linguistic cooperation takes place, ultimately reduces the practicality of implementing such cooperation (Ibid.). Yet, as Koehler has found, the specific language used within the courts and in hearings by experts, can be the very difference between what is deemed as confusing or truly helpful (2013, p. 515). And so, despite being a non-realistic possibility, specialist training for judges and experts alike is warranted, such that scientific arguments can be made via judiciary-oriented language and legal questions can be posed with regard to scientific evidence (Gaboardi, 2018, p. 16). If not, factors such as unfamiliarity and complexity with regard to scientific and technical matters, have a significant risk of confusing or even misleading the triers of fact (Coen & Hefferman, 2010, p. 197; Koehler, 2013, pp. 516-517). Therefore, up until such a point that a structured cooperation can take place, scientists within courts should strive to examine materials in a common way, attempt to use nonjargon descriptive language of scientific facts, and apply themselves to the use of judiciary-oriented language in order to reduce the risk of being misleading and unhelpful to legal actors (Koehler, 2013, p. 537; Gaboardi, 2018, p. 16). Still, this leaves the question of whether or not a reduced complexity also removes the necessary nuances of the matter which is being discussed by the scientists within the courts, and whether or not complexity of a statement in of itself is important to settling legal disputes.

Complexity. There are numerous problems pertaining to language and the complexity of scientific evidence within the intersection of science and law, yet as Baron & Sullivan argue, there are few scholars who have attempted to address these problems with a mechanistic explanation as to why they occur (2018, pp. 340-341). Chilstunoff argues in accordance with Baron & Sullivan that the best course of action for the legal community, is to produce helpful tools in assessing expert testimony in order to alleviate the courts' concerns with regard to scientific knowledge and inquiry (Chlistunoff, 2016, p. 1078; Baron & Sullivan, 2018, p. 341). However, given that the legal doctrines, which are developed to guide judges in their estimation, consideration, and determination of scientific evidence, are highly complex (Cecil, 2005, p. 74) – the issue is naturally multifaceted and legal tools for processing scientific evidence are hard to find. Still, it is important not to be dissuaded by such aspects, given that, and as Coen & Hefferman argue, the complexity of scientific evidence can have unexpected effects in producing aggravating rather than mitigating perceptions (Coen & Hefferman, 2010, p. 197; Lui, et al., 2019, p. 460). As such, there is an urgent need not only for empirical research on comprehension of complex expert evidence,

but also for research on the comprehension of scientific reasoning in order for courts to appreciate scientific complexity (Coen & Hefferman, 2010, p. 202; Cranor, 2005, p. 121).

Expert testimony is often deemed as complex due to the vagueness of relevant concepts used, and due to conflicting evidence, which provides difficulty for assessment and evaluation (Cranor, 2005, p. 127) – ultimately resulting in juror and judge indeterminacy. Therefore, whilst some scholars argue that judges and juries do possess the necessary capabilities of using and assessing complex evidence, others suspect that such perceptions are not conforming to actual practice (Coen & Hefferman, 2010, p. 202). As such, and yet again, this highlights the necessity for scientists and experts to piece together, and to present, evidence in a plausible judiciary-oriented language such that juries and judges might understand the form, complexity, and inferences made with such scientific evidence (Cranor, 2005, p. 16; Gaboardi, 2018, p. 16). However, there is one issue that is dauntingly hiding itself behind the issue of complexity and scientific evidence within common and civil legal systems alike, namely the expectancy of judges and juries to assess scientific evidence at all. Judge Learned Hand posed a question to this issue in 1901, asking how a jury or judge can assess the reliability of scientific evidence, when it is their own incompetency which is the foundation for why an expert is necessary to begin with (Hans & Saks, 2018, pp. 164-165). Taipale posed a similar question 118 years later, again with regard to both common and civil legal systems, asking how professional judges can justify discrimination of certain scientific evidence when they lack the requisite expertise to understand the issues at hand (2019, p. 311) – highlighting that this issue is far from resolved. And yet, the expectancy of judges and juries to assess scientific evidence cannot be overcome. As our society develops to become more complex and technical, legal actors are expected to have, or to attain, a rudimentary understanding of such developments in order to assess the reliability of the evidence presented within their courts (Groscup, 2004, p. 59; Gaboardi, 2018, p. 2).

The threat to legally informed outcomes thereby lies in complex testimony as it causes judges and juries alike to stay in the dark, meaning that the incapability of understanding relevant technical scientific evidence, risks leading the juries and judges to rely on heuristic processing (Lopatka, 2016, pp. 435-436) – which in turn risks leading the triers of fact to unconsciously rely on cognitive illusions and bias (Perlin, et al., 2009, p. 67). This is an issue that is not likely to dissipate on its own given that the world is continuously growing more complicated, and that the technological advances made within science perpetually influence and reverberate throughout the whole of law (Lopatka, 2016, p. 436). It is at this point

important to state two central aspects of consideration when dealing with, and with regard to, the technological advancements made within science. Firstly, it is important to state that the courts of law were not designed to develop along the lines of technological advancements or to consider ever increasing complex scientific evidence (Rubinfeld & Cecil, 2018, p. 152). Secondly, the triers of fact within our courts have never been, nor can they in the future be expected to be, granted their offices on the basis of scientific prowess and insight (Lopatka, 2016, p. 453). Furthermore, and despite the future prospects of legal practitioners being likely to become more scientifically literate along with the developments of society, fields such as neurology has proven to have a similar exponential growth pattern, with regard to publication, as that shown by technology (Hadagali & Anandhalli, 2015, p. 59; Lopatka, 2016, p. 453). As such, and given that these scientific and technical issues place a strain upon the judges and juries in question, along with the understanding that these triers of fact might lack the epistemic access to the scientific fields of relevance (Rubinfeld & Cecil, 2018, p. 152; Taipale, 2019, p. 316) – the continuous development of the sciences, such as that of neurology, might ultimately lead to a situation wherein its complex nature renders it unusable by legal practitioners, unless balances are put into place. Koehler & Miexner Jr. similarly pointed out that the burden of demonstrating reliability of the science put forth, belongs to the evidentiary proponent (2016, p. 32) – signifying that the more technologically advanced, complex, and esoteric the evidence is, the lesser the capacity is of judges to make legal assessments of the evidence (Taipale, 2019, p. 312). On this note, Rubinfeld & Cecil pointed out that evidence in some legal cases have become so complex, that even the procedural devices commonly used to grant judges and juries an insight into the issue, have become obsolete and inadequate with regard to new advancements (2018, p. 153).

Of particular interest, and of final note, is Lopatka's argument that jurors who serve in medical malpractice cases are reporting problems in understanding the technically complex evidence supported by experts (2016, pp. 444-445). This highlights one of the back-end issues of complexity, namely that complex and interrelated factors provide a clearer image through mechanistic explanations, than evidence provided to the court piece by piece (Haack, 2008, p. 255). Merlino et al. therefore suggests that judges and juries not only look to the scientific nature of the evidence and thereby its composition, but to also keep the complexity of the evidence in mind (Merlino, et al., 2008, p. 201). If not, jurors might come to favor scientific arguments that are easier to understand but wrong, instead of those who might be confusing but correct (Lopatka, 2016, p. 449). And so, despite the fact that expert testimony can provide

insight and understanding via meaningful interpretation of complex scientific data, along with the fact that expert testimony increases the probability that the court will reach a correct decision, studies have shown that judges and juries tend to freeride on these interpretations (Lambert & Oytana, 2019, p. 21; Ikhwansyah, et al., 2022, p. 507) – seemingly leaving judicial control out of judicial hands (Gaboardi, 2018, p. 16).

Central and peripheral processing. Perlin et al. argue that many judges working on cases involving mental disability express little to no doubt about the scientific evidence presented in court, is followed up by the argument that these judges assuredness tend to be based on their own prejudice and false common sense (2009, p. 83). Given this notion, Gertner & Sanders argue that the principal question for anyone interested in how triers of fact comprehend, understand, and respond to scientific evidence put forth by experts, should concern themselves with the judges' unconscious application of central and peripheral processing (2018, p. 139). Hans & Saks explains central processing as the cognitive act in which a recipient of a communication engages thoughtfully with the material in order to solve the problem at hand (2018, p. 167). Such processing can be recognized by the effortful mental activities which are required to process the communication, which not only extends to linguistic issues, but complex computations as well (Lopatka, 2016, p. 446). The peripheral processing of communication in turn relies on superficial features, such as the characteristics of the expert witness or the number of arguments made (Hans & Saks, 2018, p. 167). As such, the peripheral processing can be recognized by a quick and automated process which demands little to no effort of the judges and jurors (Lopatka, 2016, p. 445).

The unintended legal consequences of these kinds of cognitive processes, result in judicial freeriding of scientific evidence as previously mentioned. This is made evident by legal cases and trials which contain unfamiliar scientific evidence, and similarly by exposing judges and jurors to evidence beyond their comprehension, resulting in a reliance on peripheral processing and availability heuristics (Hans & Saks, 2018, p. 167; Perlin, et al., 2009, p. 67). Gertner & Sanders argue that when the evidence at hand contains a sufficiently high enough degree of complexity, such that it might be deemed as inaccessible to the triers of fact, judges and jurors are unlikely to centrally process the evidence under review (2018, p. 139). Similarly, Lopatka argues that this is the result of judges' and jurors' reliance on cognitive shortcuts, which substitutes hard and difficult to comprehend questions, with simpler questions that can be more easily peripherally processed (Lopatka, 2016, pp. 445-446). Lopatka goes on to problematize this issue, arguing that if judges and jurors were to

engage with central processing and exclude evidence on the basis that the evidence seems confusing, or if they make use of peripheral processing and consequentially create biases, they are not assimilating the evidence at hand properly (Ibid., p. 450).

In line with this problematization, much of recent psychosocial research has focused on understanding how the cognitive processes underlying causal attribution actually functions. Amongst these processes, counterfactual thinking has been of particular interest (Catellani, et al., 2021, p. 4). Counterfactual thinking is a process of mental representation wherein triers of fact compare how a chain of events has unfolded, with what is prescribed by norms and law, in order to determine a hypothetical point of deviation which attributes causality as well as responsibility to the actor (Ibid.). A consequence of such mental representations, is that it is hard to argue its accuracy, given that such mental representations tend to have an oversimplifying perspective on the relations of cause and effect, and thereby risk influencing the responsibility attributions both judges and jurors make (Ibid., pp. 4, 12). Considering that judges and jurors engage with peripheral processing along with counterfactual thinking, which puts them at significant risk of relying on biases and heuristics and overlooking the complex scientific evidence at hand, Hardcastle & Lamb poses the question whether or not this should be a surprising fact (2018, p. 912) – given that triers of fact ultimately are interested in law and human action. Lui et al. similarly problematizes the usage of scientific data, complex as well as not complex, when presented as mechanistic evidence before judges and jurors. They argue, and show, that when etiological accounts are presented within the courts, the evidence serves as aggravating circumstances with regard to culpability and sentencing severity (2019, p. 479). This ultimately leads back to Lopatka's and Gertner & Sanders' point in that judges and jurors are more likely to engage with central processing when they are able to understand the information presented to them, and that in the evaluation of complex scientific evidence they instead tend to rely on peripheral processing which is fraught with biases (Lopatka, 2016, pp. 446-447; Gertner & Sanders, 2018, p. 140).

Neuroscientific evidence in law. Considering the previous discussions, the exclusion of scientific evidence or simply the complex scientific evidence such as that of neurology, might at a first glance seem like a prudent course of action. However, as Baron & Sullivan argue, the continuous progress of science with regard to biological mechanisms, involve so many different fields of science that the exclusion of one, would ultimately have far reaching consequences for all (2018, p. 339). Furthermore, criminal law can be argued as rooted in folk psychology with regard to the conceptualization that mental illnesses are due to disruptions or

changes within psychological states, rather than being connected to disruptions or changes within the neurological structures (Ibid., p. 338). The use of neuroscientific evidence has however been steadily increasing within both common and civil law systems, due to neuroscience being more adapt at explaining behavioral functioning by arguing changes to neurological domains of behavior, cognition, and emotion (Ibid., pp. 334, 338). However, as Lui et al. has shown, research on the legal implications of neurological information paints a nuanced picture in relation to the altered perceptions of a defendant, once neurological data is introduced within the criminal proceedings (2019, p. 468). Amongst the most relevant implications is that of altered perceptions with regard to future dangerousness, fear of the defendant, and arguments for rehabilitation (Ibid., p. 469). At the moment of writing, there appears to be no definitive answers as to how jurors are affected by the evidence. However, as Taipale argues, there is likely to be a significant correlation between the technical complexity of the evidence and the capacity judges and jurors have to assess it (2019, p. 316). Taipale similarly underscores that a more advanced neuroscientific explanation of a phenomena, not necessarily provides judges and jurors with greater objective clarity, as it can also serve to expand the epistemic gap between the scientist and the triers of fact (Ibid., p. 319). As such, Baron & Sullivan argue and asks, just like Judge Learned Hand did in 1901, and Taipale did 118 years later; if the judge and jurors are not qualified, lack the epistemic access, and are uncapable of drawing proper inferences, how can such evidence ever be expected to be assessed and evaluated by non-experts (2018, p. 339)?

In reviewing these issues of neurological evidence within the courts, Chilstunoff argues that jurors risk not only failing to understand the implications of the scientific evidence, but fail to recognize its limitations, thereby influencing the way in which it is perceived (2016, pp. 1067-1068). And so, as an external party observing these issues, one might ask why the courts are not simply able to refuse evidence of this kind. Baron & Sullivan answers this question by stating that every defendant has a legal right to prove they lacked criminal responsibility to the charge which has been brought up against them, that they might not have been in control of their actions, or whether their understanding was compromised at the time (2018, p. 337). Still, there are those, as former associate justice to the Supreme Court in the United States, Antonin Scalia, who hold on to the folk psychological perspective of criminal law in questioning whether or not the culpability of a crime should rest (if at all) on a defendant's mental capacity, but rather upon the depravity of the crime in assessing criminal responsibility (Hardcastle & Lamb, 2018, p. 914). Helland, in

reviewing the admittance trend of scientific evidence within the US, argue in opposition of such reasoning by stating that the issue pertains more to an inconsistent evaluation of testimony by the judges, given the simple fact that most judges are not trained to deal with science (2019, p. 586) – indicating a preference for heuristics 'when the going gets tough'. For instance, in cases that deal with mechanistic explanations which combine several pieces of scientific evidence in order to generate a coherent neuroscientific argument, such as with cases pertaining to traumatic brain injury (TBI), the evidentiary procedure is likely to take on a Kafkaesque nature for judges and jurors, given the inaccessibility these triers of fact might experience due to the highly technical, esoteric, and complex arguments made (Taipale, 2019, pp. 313-314; Baron & Sullivan, 2018, p. 334). As Lopatka and Baron & Sullivan argue, the divide between judges' and jurors' capabilities to understand scientific evidence is likely to widen, given that up until recently neuroscience lacked the capabilities to explain the causal pathways which links brain abnormalities to observable behavior (Lopatka, 2016, p. 453; Baron & Sullivan, 2018, p. 335). Therefore, in order for judges to keep the sanctity of law from being spoiled by the advances of neuroscientific findings, these triers of fact must become aware of their own possible sources of influence, as well as find a way in which they can keep themselves up to date with the developments of the sciences, in order to avoid 'throwing dice' with criminal sentencing (Englich, et al., 2006, p. 198).

Judicial gatekeeping. Gatekeeping is a concept that regards judges' judicial responsibility to ensure that the evidence heard within the courts, meet the admissibility standard for the jurisdiction (Merlino, et al., 2008, p. 187). Merlino argues that this responsibility is influenced by confounding factors, such as personal knowledge and experience, whenever judges are assessing the scientific evidence at hand, which ultimately makes gatekeeping a case-by-case phenomenon (Ibid., p. 203). Given that judges are similarly influenced by central and peripheral processing, along with that of counterfactual assessments, the role of a judge to assess scientific evidence becomes paradoxical (Hans & Saks, 2018, p. 164). This paradox stems from the factfinders' difficulty to fully comprehend complex scientific evidence, yet the procedure of judicial gatekeeping ensures that it is the factfinders themselves who determine the legal and scientific relevance of the evidence at hand (Hans & Saks, 2018, pp. 164-165; Merlino, et al., 2008, pp. 201-203). The legal field's attempt to overcome this issue by having judges and legal professionals attend scientific seminars to better understand scientific evidence, is something that has been met with worries from the scientific fields. For instance, Haack argues that judges are as likely to make

sophisticated determinations and to notice scientific nuances in a few hours of training, as any scientist would be competent to notice nuances and make sophisticated legal determinations after a few hours of training (Haack, 2005, p. 70). Though well intended, the slapdash way in which the legal field attempts to bridge the divide between law and science, may instead run the risk of providing the judges and triers of fact with a false sense of security in that they are knowledgeable about scientific theory, methodology, and complex mechanistic evidence (Ibid.). Cashmore & Parkinson argue that judges and jurors are well aware of the importance of precise legal language, but are at risk of overlooking this fact with regard to scientific evidence which might at first glance seem familiar, but which is supported by different ideas and holds different meaning (2014, p. 239). A secondary, smaller risk, but one that is of significance, is that judges not only understand scientific evidence differently from the scientists who present it, but that they also understand it differently from other judges (Forret, 2004, p. 7). And so it is important to note, and at this point to stress, that while it is axiomatic that no judge is omniscient, every judge and thereby the respective courts, are struggling with inadequate knowledge with regard to scientific matters (Gaja, 2016, pp. 409-410; Gaboardi, 2018, pp. 10, 14). Therefore, and as Roberts points out with regard to the judicial systems' lack of scientific competence, the gatekeepers charged with reviewing scientific and technical matters at the intersection of law and the sciences, must carry out their duties with special care and consideration (2008, pp. 459-460).

The issues the legal system faces with regard to various sciences are not a new phenomenon. As previously demonstrated, linguistic challenges were shown to be the case in 1351, when fishmongers and cooks were asked to determine what constituted the selling of 'bad food' (Hans & Saks, 2018, p. 174) – and there have been plenty more interactions with other sciences since then. In the 1960s the fields of law and psychology began to interact in an attempt to challenge the everyday judicial common sense, and in order to make the forensic domain a relevant aspect of law (Arrigo, 2001, p. 1). By the time of the 1970s, psychology within law, and especially the number of psychologists had increased. This showed a continuous trend in expansion up until the 1980s, when both psychologists and psychology within law was deemed as commonplace. This trend continued up until the 1990s when psychology within law came to have an international impact (Ireland, 2008, p. 117). Similarly, in the early 1990s, complex neuroscientific evidence began appearing within both common and civil legal systems, ranging in effect from measurements in brain activity (EEG) to functional magnetic resonance imaging (fMRI) (Baron & Sullivan, 2018, p. 335). This kind

of evidence allowed for arguments of defendants' neurological abnormalities, other than those made by forensic psychology, and the application of neuroscientific evidence has steadily been increasing ever since (Ibid., p. 334). As such, and as documented in this section alone, the systems of law are faced with the issues of gatekeeping each of these developments as they are called upon to act as evidence, as has been the case for at least 672 years (since the 'bad food' case). However, Lopatka highlights that these interactions between law and science can be viewed as social trends that ultimately leaves the legal system more scientifically literate than it was before, and that the judges who are exposed to gatekeeping ultimately come away with a greater understanding of the science at hand (2016, p. 453). Still, law and the legal systems are slow to adapt to new scientific discoveries, something which Fraser et al. argue is due to scientific findings not being easily adapted for judicial application (2014, p. 144). Interestingly, Cecil argues that the proverbial floodgates have opened into the field of law, and the judicial gatekeepers have adapted to not only review certain kinds of evidence, but all of that which is presented before it (2005, p. 76). And so, and as Hans & Saks argue, given that generalist judges and juries face the challenges discussed above, our duty is now to run experiments and collect data (2018, p. 175).

METHOD (I)

Systematic literature review. As the purpose of this paper is, via broad application, to empirically test the theory of Communicative Transference (Broström, 2023a), a systematic literature review was conducted in order to determine 1) how the theory is situated within the current discourse on neurological evidence within legal systems, 2) whether or not the theory is contradictory to other theories within said discourse, and 3) whether or not the discourse can provide inferential support to the theory being tested. The literature review was conducted as a multistage approach containing three (3) separate stages. In order to minimize methodological mistakes, Chris Hart's book on conducting systematic literature reviews was also used frequently as a guide in this process (2018).

Multistage process. The first stage of the literature review pertains to the selection of a relevant search engine. EBSCOhost was selected as a suitable search engine given the 43 databases it can provide articles from, ensuring that no relevant literature was overlooked. The second stage regards the keywords, and the inclusion/exclusion criteria for the initial search. A primary keyword of 'judicial decision-making' was selected, along with a variant of 'legal decision-making'. The secondary keywords aimed to reflect 1) communication from intrasystematic sources, and 2) the deontologization process of the recipient system. As such, the keywords 'neuro*' and 'expert witness*' came to represent communication from intrasystematic sources, and the keyword 'evaluation of evidence' represented the deontologization process of the recipient system. The secondary keywords were thereafter coupled with both the primary and its variant along with the Boolean AND, generating a total of six (6) strings. At the same time a checkbox for primary inclusion/exclusion criteria was constructed.

Table 1.
Primary inclusion/exclusion criteria.

Inclusion criteria	Exclusion criteria
(1) FullText (2) Written in English (3) Peer Reviewed (4) Non-Duplicate (novel)	(1) Any articles that are not specified as by the inclusion criteria.

The search generated 163 articles for review, which were thereafter moved to the reference management program Zotero for the third stage of the literature review. The third stage pertains to reviewing the articles by means of Title, Abstract, and FullText review. The Title review serves to ensure that the initial, primary inclusion/exclusion criteria has been fulfilled, whereas the Abstract and FullText review serves to reduce the number of articles to those of greatest significance, by means of secondary and tertiary inclusion/exclusion criteria. The Title review identified 63 articles as duplicates, four (4) as not being written in English, and two (2) were excluded as they failed to meet the inclusion criteria for other reasons. The total number of novel articles to be included as part of the Abstract review thereby numbered 94. A secondary inclusion/exclusion criteria checkbox was thereafter constructed along with a primary condition as such:

Table 2.
Secondary inclusion/exclusion criteria.

<table>
<tr><th>Primary condition</th><th>Exclusion criteria</th></tr>
<tr><td>(1) Articles have to deal with X in relation to legal/judicial decision-making.</td><td rowspan="3">(1) Any articles that fail to meet the primary condition.</td></tr>
<tr><th>Inclusion criteria (X)</th></tr>
<tr><td>(1) Neuro*
(2) Expert witness*
(3) Evaluation of evidence</td></tr>
</table>

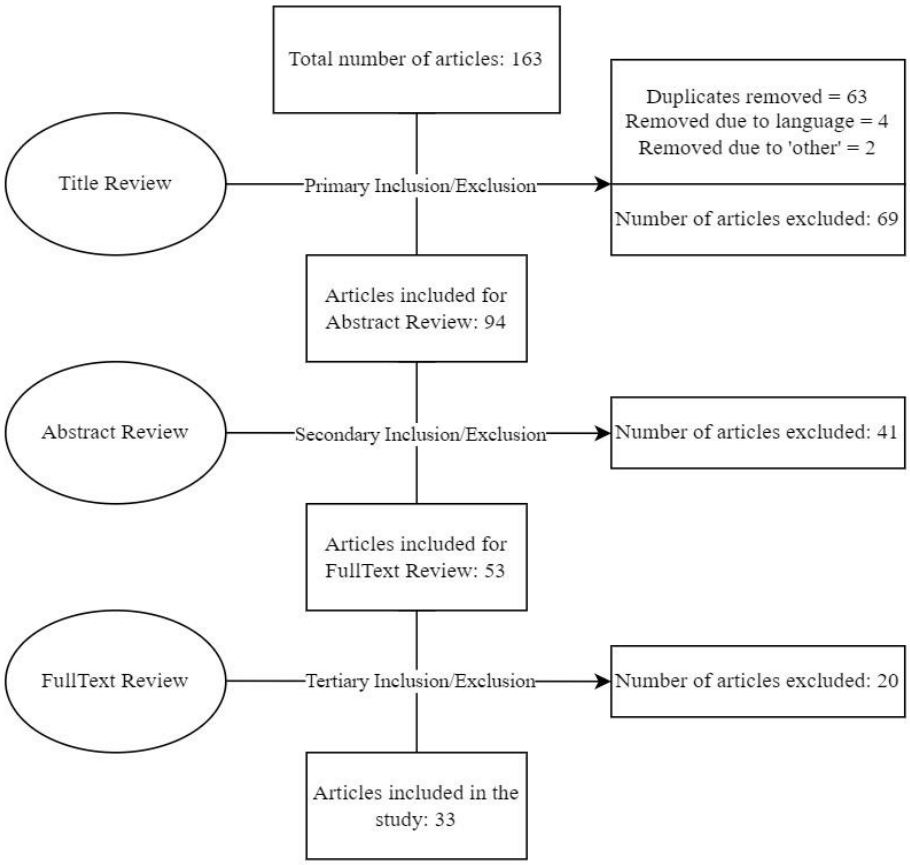
The Abstract review found that 41 articles did not meet the primary condition, and were as such excluded, leaving 53 articles to be included in the following FullText review. A tertiary checkbox for inclusion/exclusion criteria was created, which also included a second exclusion criteria. The choice to add a second exclusion criteria was made to ensure that only articles which considered some form of limitations with regard to the inclusion criteria were included, thereby excluding those articles which would only present arguments surrounding the judicial process of integrating intrasystematic data. The tertiary inclusion/exclusion criteria checkbox was thereby constructed as such:

Table 3.
Tertiary inclusion/exclusion criteria.

Primary condition	Exclusion criteria
(1) Articles have to deal with *X* in relation to legal/judicial decision-making.	(1) Any articles that fail to meet the primary condition. (2) Any articles that do not discuss potential limitations with regard to the inclusion criteria.
Inclusion criteria (X)	
(1) Neuro* (2) Expert witness* (3) Evaluation of evidence	

The tertiary inclusion/exclusion criteria for the FullText review resulted in a total of 33 novel articles of high significance to be included in the paper, thereby excluding another 20 articles.

Figure 1.
Flowchart of systematic literature review.



METHOD (II)

Multiple case review. In order to both engage with broad application of the theoretical framework, and in order to answer the research question of the paper, a multiple case review was chosen as the mode of collecting relevant data. In order to gain access to the legal cases needed for review, an account was set up at *jpinfonet.se*, which is a database service that provides access to criminal law cases from all 48 district courts in Sweden. Search parameters were thereafter constructed to ensure that a large enough timespan was considered, such that the hypothesis regarding exposure would be able to attain an element of temporality and thereby frequency. A period of ten (10) years ranging from 01/01-2012 to 31/12-2022 was deemed as sufficient to provide an insight into a relative frequency of exposure, with regard to the prevalence of neuroscientific data within the courts. An initial search was also made without any keywords in order to determine the availability of cases within the ten (10) year period. The search returned 583.399 criminal cases across the 48 district courts. A secondary search using the keyword 'psych*' was made along the same parameters, in order to determine the prevalence of psychological terminology within the district courts. This resulted in 64.916 cases, corresponding to 11% of the criminal case population. A tertiary search was then made with the keyword 'neuro*' which resulted in 2.741 novel cases. This result corresponded to 0.47% of the larger criminal case population, which was deemed as being a manageable number of cases to review.

Theory operationalization. The operationalization of the communicative transference theory considered the following: 1) Who is the communicating party (*Source of Communication*), 2) What information is being transferred (*Information*), 3) What is the neuromedical terminology of focus (*Focus Word*), 4) To what field does the terminology belong (*Dimension (main)*), 5) Is there a subdimension to which the terminology belongs (*Dimension (sub)*), 6) What is the length of the communication (*Information code length*), 7) With what frequency is the focus word used within the sample (*Frequency of Focus word*), 8) Is there an explanation of the focus word within the information transferred (*Explanation of Focus word*), 9) Is a contextualization offered with regard to the focus word in the information transferred (*Context regarding Focus word*), 10) What is the complexity of the communication (*Grading Statement Complexity*), 11) Where in the legal case is the communication incorporated (*Statement Adherence set*), and 12) What is the adherence of the legal system to the transferred communication (*Grading Statement Adherence*) – which provided an extensive codification schedule (see *Appendix* for *Codification schedule*).

Procedure. Given that legal cases are qualitative in form and that the hypotheses of this paper require quantitative data with regard to *frequency* and *degree*, a mixed method sequential explanatory design was chosen, such that the qualitative data collected from the cases could be quantified for further analysis (Bryman, 2018, pp. 763-764; Ivankova, et al., 2006, p. 5). In order to ensure that only legal cases which pertain to the defendants neurological circumstances were included in the study, inclusion/exclusion criteria was created to better be able to deal with the neuro* sample. This was made to ensure that other mentions of neuro*, such as: 1) The plaintiffs neuro* circumstances, 2) Pleas for neuro* investigations, 3) The occurrence of neuro* workplace descriptors, 4) Treatment centers argument for neuro* treatment availability, and the like, were excluded from the sample.

Table 4.
Inclusion/exclusion criteria for defendants neurological circumstances.

Inclusion criteria	Exclusion criteria
(1) Cases which pertain to defendants neurological circumstances.	(1) Any cases which are not specified as by the inclusion criteria.

Keyword searches using ‘neuro*’ was made within each of the cases to determine whether or not they fulfilled the inclusion criteria (Bryman, 2018, pp. 365-366). This resulted in a total of 735 cases across the 48 district courts to be included in the study with 2.006 cases being excluded. The extraction process of the data was thereafter done using keyword searches along with continuous comparisons (Beach & Pedersen, 2019, pp. 131, 140, 270-272; Bryman, 2018, pp. 154-157) – against the established definitions and the codification schedule. The keywords ‘neuro*’, ‘diag*’, ‘yttra*’, ‘utlåt*’, ‘inhämt*’, ‘utred*’, and ‘rättspsy*’ allowed for identification of relevant passages as they pertain, and can roughly be translated into: *neurology, diagnoses, opinion, dictum, collected, investigation,* and *forensic psychiatry*. This ultimately enabled an organized and efficient way in which the data, from each of the 735 cases, could be extracted and copied onto the codification schedule.

Method for analysis. In reviewing the legal cases, as has been shown, the use of a tool for quantifying qualitative data was developed and employed. However, due to the choice to engage with continuous comparison and codification of the data (Beach & Pedersen, 2019, pp. 131, 270-272; Bryman, 2018, p. 688) – i.e., continually reviewing and analyzing the data,

it was found that the tool did not produce the results needed to answer the established research question, but rather provided data for, and demonstrated a practical example of, *structural coupling*. This data, and the results thereof, will be reviewed under the section *Results*. Given that the results of the quantifying tool was unable to provide an answer for the research question, it became necessary to recognize that the adoption of a complementary method was needed. Furthermore, and given that the quantitative perspective provides a larger purview of between-case inferences in the sample, a qualitative approach using *process tracing* and *nested analysis* was deemed as being able of providing within-case inferences of the communicative process (Beach & Pedersen, 2019, pp. 89, 100; Lieberman, 2005, p. 245).

METHOD (III)

Qualitative approach. Beach & Pedersen argue that for *process tracing* to be able to provide within-case inferences, cases need to be selected prior to the operationalization of tests, given that within-case traces, i.e., mechanistic evidence, are case-sensitive (Beach & Pedersen, 2019, p. 258). Firstly, this means, in essence, that a selection of a population must be made within which the mechanism, i.e., communicative transference, can reasonably be expected to be found (Ibid.). Having already selected a population (N=2741) and having reduced that population into a stratum based on the inclusion/exclusion criteria priorly stated for the quantitative analysis (N=735), along with minimizing the selected sample into the cases already analyzed (N=150) – a reasonable substratum of cases within which the mechanism can be found, has already been identified (Ibid., p. 90). Secondly, and as argued by Lieberman, when combining a statistical analysis of a Large-N group (N=150), with an in-depth analysis of one or more cases within the selected sample, a comparative research approach called *nested analysis* can be employed (2005, p. 435). Furthermore, and of particular note, the *process tracing* method, of identifying and reviewing the way in which mechanistic evidence presents itself within individual cases, as well as the *nested analysis*, of qualitatively reviewing cases selected from a quantitative sample, are both copacetic with the mixed method sequential explanatory design chosen for the paper, as well as with each other (Bryman, 2018, p. 763; Lieberman, 2005, pp. 436-437; Beach & Pedersen, 2019, pp. 105-106) – meaning that the potential methodological pitfalls that might otherwise occur, need not be stressed.

Process tracing. At the theoretical level of understanding process tracing lies the counterfactual understanding of causation (Beach & Pedersen, 2019, p. 33) – which is defined as an outcome being produced by a given cause, because an absence of the cause would

produce an absence of the outcome, should everything else be equal (Lieberman, 2005, p. 441). However, and of important note, the chain of events which leads from an established cause to that of an established outcome is a black-box phenomenon (Beach & Pedersen, 2019, p. 32) – meaning that Large-N inferentials are only able to identify the spatiotemporal region within which the cause and outcome are known to have occurred, but tell nothing about the causational chain of events between the two (Ibid., p. 93). Therefore, the responsibility of the researcher when employing a process tracing method to such cases, is to identify evidence linking the cause to the outcome (Lieberman, 2005, p. 444). As such, the qualitative analysis here, will be making use of so called *Type I Typical Cases* wherein cause, contextual conditions, and outcome are present (Beach & Pedersen, 2019, pp. 90, 97). Furthermore, by making use of Type I cases selected from a Large-N sample, a measure of generalizability can be granted by noting empirical fingerprints of the mechanism within the specified sample (Ibid., pp. 276-278). Additionally, *Type IV Deviant Consistency Cases*, wherein cause and contextual conditions are present, but the outcome is not, are to be analysed in order to determine the boundaries, or thresholds, for what can reasonably be generalized within the Large-N sample (Ibid., 97; 277-278). The Type I and Type IV cases thereby compose yet another substratum, hereafter referred to as *Small-N sample*. However, and regarding the process tracing approach, this paper *will not* be making use of a *hypothesized progression* between cause, events, and outcome, in order to ensure that the Small-N sample is not unnecessarily influenced by the researcher's own perspectives and presumptions. This means that only the cause (neurological circumstance of the defendant) and the outcome (adherence of the court to such circumstances) are determined, and the events which couple the cause to the outcome are those which are to be identified. This is also well suited to the usage of Type I and Type IV cases, as the Type I cases provide insight into the causation between cause and outcome, while the Type IV cases provide an insight into the boundary-cases wherein cause and contextual conditions are present but outcome is not (Ibid., pp. 90, 97, 276-278).

Finally, a brief discussion on the identification of mechanistic evidence *without* a hypothesized progression within the Type I and Type IV cases. Because the mechanistic evidence left behind is dependent upon both the case being studied, and the theory employed, a hypothesized progression provides the researcher with delineations in the material of *where* to look for the mechanistic evidence (Ibid., p. 171). However, as this paper chooses to not engage with such hypothesized progression, the entire material is available for in-depth analysis. As such, what is initially known about the two cases is that they share a similar

cause (the neurological circumstance of the defendant), similar contextual conditions (the source from which the communication is offered), but are dissimilar in outcome. This will in turn, via the application of continuous comparisons, enable the identification of both causal and contextual conditions that provide a point of deviation for the Type IV case, leading to a different legal outcome (Ibid., pp. 131, 270-272). Such a point of deviation can be identified via both *sequence* and *trace evidence*. Sequence evidence refers, as the name implies, to evidence which link events in a spatiotemporal chronological order, whereas trace evidence refers to the immediate trace providing proof of existance (Ibid., p. 172). For instance, trace evidence would be the identification of an intrasystematic source communicating with the legal field, thereby providing proof of existance for intrasystematic communication, whereas sequence evidence would be the demonstration of such a communication producing a response within the legal system. As such, the process with which this paper aims to identify both sequence and trace mechanistic evidence, is by the continuous comparison of the Type I and Type IV cases. This will be done by: 1) denoting *case specific details*, i.e., details which are of a most different kind between the two cases, thereby highlighting thresholds and boundaries, 2) denoting *case similarities*, i.e., details which provide an insight into the most similar aspects of the cases, thereby highlighting within-case similarities that bind cases together in causal progression, and 3) denoting *contextual conditions*, i.e., details of a setting which might have an impact on the constitutive parts of the communicative transference mechanism (Ibid., pp. 131, 140, 258, 270-272). By identifiying, and color-codifying such details, a functional module of *most different and most similar statements* (MdSs) can be applied for both the process tracing, as well as for the nested analysis. An example of the MdSs-module can be found in *Table 5*.

Nested analysis. Engaging with a nested analysis when adhering to process tracing methodology is not particularly uncommon, given that most researchers will undoubtedly have to rely some kind of tracing methodology in order to determine processes pertaining to their inquiry, and to delineate their projects before engaging with the analysis. However, it does open the window to certain critique regarding the issue of analytical eclecticism. Analytical eclecticism is defined as the incorporation of several different kinds of mechanisms, as they are used and defined within different research traditions, in order to provide causal stories of certain events (Ibid., pp. 282-283). Therefore, it is important to note that process tracing *can* be used when the aim is to gain a greater understanding about the causal dynamics which resulted in a particular outcome (Ibid., p. 1). Similarily, Small-N

analysis (SNA) is a mode of analysis by which causal inferences regarding a particular unit are derived, *either* from process tracing of causal chains *or* via qualitative comparison of cases (Lieberman, 2005, p. 436) – both of which are captured in narrative form. The nested analysis thereby incorporates both *Large-N statistical analysis* (LNA) with *in-depth SNA*, such that the LNA might provide particular insight into general relationships *between* cases, whereas the SNA provides specific explanations *within* cases (Ibid.). As such, and as argued by Lieberman, the prerequisits for engaging with a nested analysis is the availability of a quantitative dataset and a baseline theory (Ibid., p. 438) – both of which can be found as part of this paper. Furthermore, and given Lieberman's argument that the SNA should be used to answer questions which the LNA were unable to provide an answer for, *this* SNA will focus on investigating the specific contextual and causal relations which provide a pathway between the cause and outcome (Ibid., p. 440). This particular focus is key in combining LNA with SNA in a nested analysis, as the SNA is able to provide different elaborations of mechanisms and concepts through *comparisons* or via *process tracing* of causal chains, thereby providing an empirical foundation from which narrative assessments of counterfactual claims can be made (Ibid., p. 441).

Small-N analysis. Initially it is important to note, as Lieberman warns, that by *increasing* the number of cases in the SNA, the more likely the SNA is to *decrease* in specificity while increasing in superficiality (Lieberman, 2005, p. 442) – which is why this paper only considers one (1) Type IV case and one (1) Type I case, which is still greater than Liebermans lowest suggested number of one (1) case (Ibid., pp. 435-436). Furthermore, the cases within the LNA sample were divided up into separate groups based on Type I (N=145) and Type IV (N=5) belonging, allowing for a selection of cases with similar *contextual conditions* to be chosen within each of the groups, in order to minimize possible confounder influence. This was also done to ensure that cases which are, and are not, explainable by the hypotheses could be analyzed using the *most different and most similar statement* (MdSs)-module (Beach & Pedersen, 2019, pp. 131, 140, 258, 270-272; Bryman, 2018, p. 688) – such that thresholds as well as causal chains could be determined within the cases. An example of this module, using the two chosen cases of this paper and detailing a section of how the analysis of the cases is conducted, can be seen in *Table 5*.

Table 5.
Example of most different and most similar statement module in SNA (MdSs-SNA).

Type I **Case ID:** @1N9q5	**Type IV** **Case ID:** 5hX41^
Presumption	**Presumption**
Violence against a civil servant is a crime of such nature that there is a presumption for the penalty to be determined as imprisonment. In order for a non-custodial penalty to be chosen, there must be special circumstances.	There is a very strong presumption for imprisonment, above all because of the gross drunk driving. In the event of a blood alcohol content of 1.5 per thousand and higher, an interventional contractual care with a stay in a treatment center is in principle required for the penalty to be equated with a prison sentence, and the presumption of imprisonment is even stronger with a blood alcohol content as high as 2.19.
Codification Schedule for Continuous Comparisons	
Case specific details: - Violence against a civil servant - Gross drunk driving Case similarities: - Presumption Contextual conditions: - Non-custodial penalty - Interventional contractual care with a stay in a treatment center	*Case specific details* are of the most different kind, which highlights separations between the cases and thereby highlighting thresholds and boundaries. *Case similarities* provide an insight into the most similar aspects of the cases, denoting within-case similarities which bind the causal chains together. *Contextual conditions* are those aspects of a setting which might have an impact on the constitutive parts of a mechanism.

CONSIDERATIONS

Ethical. The 7 § of *Act (SFS 2018:218) with supplementary provisions to the EU's data protection regulation* stipulates that the collection of sensitive personal data is allowed with support of 9.2. J of the *General Data Protection Regulation (2016/679)*. This, in essence, means that sensitive data of a personal nature is allowed to be collected, but only on the premise that the collection of such data has a public interest which clearly outweighs the risk of undue intrusion into personal integrity. Similarly, the 21 § of *Act (SFS 2003:460) on ethical review of research involving humans* state that research on human subjects is allowed without their expressed consent, provided that the purpose of the research is to provide a result which could benefit the person in question or someone who is suffering from the same disease or disorder. However, the 3 § 2 p. of the same Act argues that any personal data pertaining to the violations of the law, judgements in criminal cases, or that regard crime, are subject to ethical review. Therefore, the most important paragraph for this study is the 2 § of the same Act, regarding research involving human subjects. The 2 § makes clear that no ethical review is necessary when the review, collection, and presentation of data, is made as part of studies within the framework of a university education. As such, given that: 1) the research is conducted in the hopes of producing a result which will prove beneficial to people with various neurological diseases and disorders, 2) the research has a high public interest which arguably outweighs the possible intrusion of personal integrity, and 3) the fact that this study takes place as part of a university education, there exists no legal or ethical hindrances as to the completion of the study. This would however be a very simplistic interpretation of the responsibilities that a researcher have towards the non-consensual parties. And so, given the sensitive nature of the data collected, two-step insurance-measures have been put into place to ensure that none of the individuals can be identified post publication of the paper (Bryman, 2018, pp. 170-172). The first step was to ensure that the legal cases were downloaded onto an external hard drive which was alphanumerically password protected, granting access only to the researcher and the supervisor. This ensured that no illicit access to the legal cases could be made. The second step pertained to renaming all of the cases alphanumerically, followed by the thorough removal of all possible identifiers within the extracted data, such as: pronouns, names, age, gender, as well as any dates or identifiers pertaining to when and where the case was settled.

Methodological. Given that this study makes use of a mixed method sequential explanatory design, incorporating both qualitative and quantitative methodology, the issue of

clearly detailing matters of reliability and validity for both the qualitative and quantitative methodology becomes paramount. With regard to the qualitative methodology, matters such as dependability, credibility, transferability, and confirmability have been given considerable thought, just as reliability and validity has been given equal thought with regard to the quantitative methodology. Dependability as a qualitative factor can be roughly understood as the corresponding qualitative factor to reliability in quantitative works (Bryman, 2018, p. 468) – and so considerable time has been devoted to presenting the precise methods by which data has been collected, how it has been interpreted, analyzed, and ensuring enough contextual information has been presented such that the research might be replicated (TheFarnsworthGroup, 2023). Credibility within qualitative research can in turn be understood as corresponding to the quantitative measurement of internal validity (Bryman, 2018, p. 467) – and so here too considerable time has been devoted to ensuring the accuracy of the study's findings by engaging with a process of triangulation, i.e., by conducting a systematic literature review to provide an overview of the issue from multiple researchers, and by collecting primary qualitative data to be quantified (Bryman, 2018, pp. 467-468; TheFarnsworthGroup, 2023). Transferability within qualitative research can furthermore be understood as corresponding to the quantitative measurement of external validity (Bryman, 2018, p. 467) – which is why considerable space within this paper has been devoted to providing extensive descriptions of the theory, the method and methodologies for application, along with a review of empirical findings (TheFarnsworthGroup, 2023; Bryman, 2018, p. 468). The broad application of a communications theory at the intersection of neurology and law provides insight into the transferability of the theory, especially considering that the theory was not developed with the specific fields of neurology or law in mind. Finally, confirmability in qualitative research corresponds to the measurement of objectivity (the minimization of subjective influence) in quantitative research (Bryman, 2018, p. 467) – which is why reflexivity has been of central importance in the operationalization of the theory, collection of the data, construction of a codification schedule and therein detailing the process of quantification, ensuring that the data speaks for itself (TheFarnsworthGroup, 2023; Bryman, 2018, pp. 470-471).

With regard to ensuring validity and reliability in the quantitative methodology, specific focus was initially given to the prevalence of random and systematic errors (Lindstedt, 2019, p. 116). By clearly detailing and providing descriptions of method and methodology, the wrongful application of said method and methodology is reduced, which

ultimately increases the validity of the project as a whole. Similarly, by including negative cases from the research material and highlighting these as relevant random errors, the reliability of the project is also increased as a whole (Bryman, 2018, p. 259; Lindstedt, 2019, pp. 116-117). Thereafter, and with regard to the measurement of validity pertaining to theory, the paper has specifically considered content validity, construct validity, and criterion validity. Content validity, in short, refers to whether or not the instrument at hand (communicative transference) adequately covers all of the content it should, with respect to its variable (communication) (Heale & Twycross, 2015, p. 66). Granted that the theory necessarily subsumes any and all communication occurring between two systems at a given moment of interaction, this can be presumed as being the case. The primary constructs of the theory, which are complexity and adherence, have also been developed and motivated using clear argumentative texts (see *Appendix* for *Creation of 5-point Likert Scale for grading statement complexity*, and *Creation of 5-point Likert Scale for grading statement adherence*), generating clear operationalizations and definitions within the codification schedule. This ultimately refers to the primary aspect of construct validity, namely theory evidence, meaning that the theoretical presuppositions are supported by the empirical evidence at hand, which is also demonstrated by the previous research and thereafter the results (Ibid.). Furthermore, and with regard to criterion validity, the study has relied on predictivity in order to support the claim that the criterion is valid. In essence, predictive validity (predictivity) can be understood as the ability of the instrument at hand (communicative transference) to predict a future outcome (Ibid.) – e.g., Adherence to greater complexity occurs given the frequency of exposure. This finally brings us to reliability. Seeing as reliability regards the consistency of a measurement (Bryman, 2018, p. 207) – and given the issues which occurred regarding the quantification of qualitative data with respect to complexity, this has presented some issues which are discussed under the section of limitations. Reliability of the theory has however been considered using the aspects of test-retest with regard to both structure, formulation, and operationalization of the theory (Heale & Twycross, 2015, p. 66; Bryman, 2018, pp. 207-208). By generating a detailed codification schedule with in-depth explanations, and initially reviewing the Large-N sample in accordance with the codification schedule, and thereafter engaging with comparative analysis of the Small-N sample using the MdSs-module, prior to analyzing the data in accordance with the communicative transference framework and with reference to previous literature, the theory achieves a measure of stability, allowing for future retesting (Cambridge Cognition Ltd, 2023; Bryman, 2018, p. 208).

RESULT

This paper has made use of a mixed method sequential explanatory design starting with a qualitative systematic literature review (N=33), followed by a quantitative data collection and Large-N analysis (LNA) (N=150), before concluding with a qualitative Small-N analysis (SNA) of two legal cases (N=2). This section will narratively detail the nested analysis of the Large- and Small-N data before arguing the results from the systematic literature review. These sections will thereafter act as the basis for which the communicative transference framework and its broad application is to be examined.

Large-N data. The developed tool for quantifying the gathered data, as has been shown, did not live up to the expectation set by the researcher in that it did not produce results which could be used to answer the research question at hand. Instead, and as similarly argued, the data demonstrated a peculiar relationship between *the legal system* and certain *legal institutions*. The data revealed that, rather than *complexity*, the specific *neuromedical terminology* and the *sources of communication* accounted for 44.6% of the variance with regard to adherence (R^2=0.446). In fact, *complexity* as a construct – being composed of the *frequency* by which neuromedical terminology is present across the entire sample, as well as whether or not there is an *explanation* provided for the terminology used in the specific cases, and/or if a *context* has been provided regarding how the neuromedical terminology might help legal professionals understand the relationship between action and neurology – only explained 4.89% of the variance in *adherence* (R^2=0.0489). In the overall Large-N sample (N=150) there were 153 *sources of communication* to be found with regard to *incoming* communication, out of which 73% (N=112) were deemed as being *legal institutions*. As such, although unintentionally, the data came to reflect the relationship between the legal system and the legal institutions *more so* than the relationship between the medical field and the legal field. However, and despite the data being unintentionally generated, much like Sir Alexander Fleming's fungal infestation, the outcome of the data is to be understood as highly important. For instance, and as shown in the appendix *Large-N Data*, the Swedish Probation Service, which account for 39.2% (N=60) of all sources of communication, also account for 45% (N=41) of all level-4 counts of adherence, irrespective of the complexity of their communication. Comparatively, the *Forensic Psychiatric Opinion,* the *Forensic Psychiatric Examination,* and the *Neuropsychiatric opinion*, which accounted for 2.3% (N=3) of all sources of communication, were responsible for 60% (N=3) of all level-0 counts of adherence, irrespectively of the complexity of their communication. This renders some

empirical support to the second hypothesis of this paper, namely that: *the greater the frequency of exposure to intrasystematic communication, the greater the adaptivity of a recipient system to new communication from the same source.* Similarly, and to that point, ADHD as a neuromedical concept communicated by various sources, accounted for 27.6% (N=61) of the total sample, making it the most frequently used neuromedical concept. As can be seen in the appendix *Large-N Data,* ADHD, when used in intrasystematic communication and irrespective of its complexity, generated 37 counts of level-4 adherence within the recipient system, which corresponds to 60.6% of all counts with regard to ADHD. Similarly, ADHD generated 16 counts of level-3 adherence, corresponding to 26.2% for a cumulative value of 86.8% between the third and fourth level of adherence, with regard to all counts of ADHD. Furthermore, and to the same point, Asperger's syndrome accounted for 5.9% (N=13) of the total sample, but with a 76.9% (N=10) level-4 adherence out of 13 counts generated.

Of important note, while this paper has engaged with the working hypothesis that complexity of communication influences the level of adherence within the legal system, the data did not support such a claim, as is evident of the linear regression between complexity and adherence (R^2=0.0489, F=2.78, df1=4, df2=216, p=0.028). Still, this result speaks more to the validity of complexity as an independent variable of adherence, than it does to complexity as a stand-alone construct. This is made evident in that complexity as a construct is bound by the frequency of exposure with regard to neuromedical terminology within a select sample, as well as to the prevalence of explanations and contextualizations, whereas adherence is bound by the place in which the communication from external systems occurs, within the given legal document. As such, the investigation of the black-box phenomenon via use of LNA regarding complexity and adherence, is made highly difficult using the original quantifying tool. Still, these results do not argue against the first hypothesis of the paper: *The greater the complexity of the communication from an external system, the lesser the degree to which the recipient system adheres to such communication* – but rather shifts the focus onto the source and its way of communicating such information. This point is made highly evident by the Small-N sample, which can be reviewed below.

Small-N data. The results of the two cases, *@1N9q5* (Type I Typical Case) and *5hX41^* (Type IV Deviant Consistency Case), provided a highly differentiated image from the Large-N data. Initially, and using *the most different and most similar statement module for small number analysis* (MdSs-SNA), it was found that 1) *the prosecutors' motion*, 2) *the evidence*, 3) *the plaintiffs' motion*, 4) *the grounds for sentencing*, and 5) *the sentencing* – were

the most central aspects for identifying empirical fingerprints of the communicative transference mechanism, as well as to identify theoretical thresholds. Within the *prosecutor's motion* of the Type I case, a minimalist summary of the event, as the prosecutor understood it to have happened, was made using both **legal terminology** and consequential arguments, as can be seen in the following excerpts:

> "*[…] violently **assaulted** [plaintiff 1] in the exercise of [hens] authority by taking a stranglehold around [hens] neck with pain and shortness of breath as a result."* – (@1N9q5, p. 9)

> *"[…] violently **assaulted** [plaintiff 2] in the exercise of [hens] authority by giving [hen] several blows to the head with a card case and several blows with a clenched fist to the face. As a result of the assault, [plaintiff 2] suffered pain and injuries."* – (@1N9q5, p. 9)

Similarly, the Type IV case made use of both **legal terminology** and consequential arguments, but with an addition of a ***most different statement***, that the defendant had committed the act of assault *with intent*:

> "*[…] [the defendant] grabbed [the plaintiff's] one arm at the same time as [hen] pinned [the plaintiff's] body against a door. The violence has caused [the plaintiff] pain, tenderness, and bruises.* ***[The defendant] committed the act with intent.***" – (5hX41^, p. 12)

The Type IV case also contained a second charge of *gross drunk driving*, and here too the prosecutor made use of legal terminology and consequential arguments to describe the events as they had understood it to have happened, along with a similar argument of intent. Furthermore, both cases, within the prosecutors' motion, presented *contextual conditions*, i.e., aspects of a setting which might have an impact on the constitutive parts of the communicative transference mechanism, namely: 1) that the plaintiffs in @1N9q5 were civil servants who exercised their authority, and 2) that the defendant in 5hX41^ could not deny or confirm the act of gross drunk driving, as the defendant had no memory of the act due to intoxication. Of note, similar occurrences regarding most different (hereafter named *case specific details*), most similar (hereafter named *case similarities*), and contextual condition statements could be found throughout the two cases.

With regard to case similarities of evidence, both cases made use of oral and written evidence in that they heard the defendant, the plaintiff(s), and witness(es), as well as made use of various written evidence, including the preliminary investigation report. However, and with regard to case specific details, under the subheading of *Processing,* the Type I case had noted that the estimated time for the negotiation would be approximately 2 hours, but under which the Type IV case had made a note that a Probation Service statement should be collected for the main hearing. Furthermore, in both cases there were case similarities with regard to individual claims made for damages, both of which referenced the 6 § of the Interest Act (1975:635). However, when presenting the individual claim, contextual conditions were identified in both cases as the prosecutor in the Type I case made use of the phrase: "*[…] [the defendant]* <u>*be ordered*</u> *to pay damages […]"* (@1N9q5, p. 3), whereas the prosecutor in the Type IV case instead used the phrase: "*[…] [the defendant]* <u>*be obliged*</u> *to pay damages […]"* (5hX41^, p. 11). Thereafter, and with regard to the grounds for sentencing, case similarities were identified as belonging primarily to structure, with the major difference in the similarities between the two cases being the amount of evidence they had to present, given that the Type I case only argued for one (1) charge, whereas the Type IV case argued for two (2) charges. However, in the district courts' assessment of the grounds for sentencing, case specific details were identified in that the Type I case referred to the 17th chapter of the criminal code with regard to assaulting a civil servant, and similarly referenced that the reliability of the witness could be called into question. In comparison, the Type IV case highlighted *the defense's* argument that the plaintiff had been the instigator of the event which ultimately led to the plaintiff being assaulted.

The sentencing section within the two cases referred to the statements offered by the Probation Service, discussed the neuropsychiatric diagnoses at hand, and whether these were enough to override the presumption to pursue a verdict of imprisonment. As such, but with some difference, both cases argued with a similar structure dependent upon the incoming communication. There were however distinct differences within the incoming communication, which could be argued as constituting contextual conditions that ultimately influenced the mechanism. For instance, and as shown below, the Type I case presented the following argument from the Probation Service:

> *"The Probation Service has stated the following. [The defendant] has a neuropsychiatric disability in the form of ADHD and Asperger's syndrome. Furthermore, [hen] has a documented drug problem. Through the adult*

unit of the Social Service, [hen] has been granted a stay at a treatment home in [redacted] with a focus on strengthening [hen] in [hens] neuropsychiatric problems, offering medication for ADHD and working with [hens] drug problems. The risk of recidivism is assessed as low to moderate, but [hen] is in the risk zone for developing a criminality problem, which is why there is a need for monitoring. Probation could have positive effects and it could advantageously be combined with a provision that [hen] must follow the planning drawn up by the Social Service." – (@1N9q5, pp. 6-7)

The communication was thereafter assessed by the court, which provided the following statement:

> *"Violence against civil servants is a crime of such a nature that there is presumption for the penalty to be imprisonment. In order for a non-custodial penalty to be chosen, special circumstances must exist.*
>
> *The crimes that [the defendant] is guilty of have a prison sentence equivalent to one month in prison. In view of what is evident from the statement of the Probation Service, there is a special reason not to pursue the sentence of imprisonment in this case. The district court shares the Probation Services' assessment that there is a need for monitoring. Probation is the most appropriate punishment for [the defendant]. The penalty is therefore determined as probation with a stipulation that [the defendant] must follow the plan drawn up by the Social Service."* – (@1N9q5, p. 7)

However, when comparing this argument to that of the Type IV case, there is a notable difference in both the opening statement, the communication made, and the assessment of the district court with regard to said communication:

> *"There is a very strong presumption for sentencing to prison, above all because of the gross drunk driving. With a blood alcohol content of 1.5 counts per thousand and higher, interventional contract care with a stay in a treatment home is in principle required for the penalty to be comparable*

> *to a prison sentence, and the presumption of imprisonment is even stronger with a blood alcohol level as high as 2.19."* – (5hX41^, p. 8)

As seen in the opening statement, the court makes the point to highlight the legal requirements to override the presumption at hand, which is similar to how the Type I case argued *special circumstances* to override the presumption. Only thereafter did the Type IV case provide an insight into the communication made:

> *"The Probation Service has proposed probation with prescriptions for outpatient treatment along with the impact program relapse prevention. Currently, the outpatient care consists of a conversation-contact one day per week, but there are plans to eventually offer additional interventions in the form of medication for [the defendant's] neuropsychiatric problems in the form of Asperger's syndrome and ADD, as well as treatment with Antabuse-like preparations. Furthermore, the Probation Service proposes that [the defendant] should undergo the influence program relapse prevention. The Probation Service has referred to the fact that the probation with treatment home-stay that [the defendant] was sentenced to in [redacted] gave [hen] a clear insight into, amongst other things, what triggers relapse into alcohol abuse and that they see a clear positive development."* – (5hX41^, p. 8)

Of note here is that the Probation Service does not provide an assessment of recidivism risk for the defendant, nor the possible positive influences that partaking in the relapse prevention program could entail, or why probation should be considered an option. As such, and given that the court has already argued that there is a strong presumption for imprisonment, the district court's assessment provided the following statement:

> *"In the opinion of the district court, the proposed regulation of outpatient treatment is not particularly invasive. When it comes to medication, it is possible to take medication for anxiety and depression, but not for Asperger's syndrome. This neuropsychiatric disability requires other interventions. In other words, it is unclear what additional medication could contribute to and whether the proposed measures include adequate support. Furthermore, the district court can state that the relapse*

> *prevention program consists of eight sessions of 90 minutes, not a particularly interventionist measure either. The proposed measures cannot therefore be equated with contract care at treatment homes.*
>
> *In summary, the presumption of imprisonment in this case is so strong that the proposed probation cannot substitute for a prison sentence, even if combined with community service. [The defendant] must therefore be sentenced to prison in accordance with the penalty value."* – (5hX41^, pp. 8-9)

When comparing these two cases, it is noted that the Probation Service in the Type I case argued very clearly and in logical progression that: 1) the defendant has a neuropsychiatric disability in the form of ADHD and Asperger's syndrome, 2) the defendant *has been granted* a stay at a treatment home, 3) the treatment home has a *focus* on strengthening the defendant in dealing with his/her neuropsychiatric problems, 4) the treatment home is offering medication for ADHD and is willing to work with the defendant to overcome substance abuse, 5) there is a low to moderate risk of recidivism, 6) the defendant is in a risk zone for developing a criminality problem and *so there is a need* for monitoring, 7) the probation could have positive effects, and that 8) it could advantageously be combined with other provisions. Comparatively, the Probation Service in the Type IV case made a very general argument in that they: 1) propose probation with prescriptions for outpatient treatment along with the impact program relapse prevention, followed by 2) descriptions of outpatient care, with 3) plans to *eventually offer additional interventions*, which consist of 4) medication for the defendant's neuropsychiatric problems in the form of Asperger's syndrome and ADD, by 5) referring to the fact that probation with treatment home-stay in previous sentencing provided insight into relapse, and 6) that they see a clear positive development. As such, these arguments interacted with the court in a highly differentiated manner by either arguing the defendant's or a general position, causing the *contextual condition* to become a *causal condition*, i.e., aspects of a setting which have a direct impact on the constitutive parts of the mechanism of communicative transference.

Systematic literature review. The systematic literature review for this paper ended up including 33 articles, within which five (5) central topics were identified. These topics were: *Language, Complexity, Central and peripheral processing, Neuroscientific evidence in law*, and *Judicial gatekeeping.* It was found within the articles that these topics were

continuously brought up and referenced in relation to neurolaw, which suggested it to be an overarching theme within the literature. However, neurolaw was ruled out as its own topic, given that a preliminary investigation into neurolaw provided an extensive range of topics regarding: *FMRI hemodynamic response function (HRF) as a novel marker of brain function* (Rangaprakash, et al., 2021), *Law, evolution and the brain* (Jones, 2004) and *Is a picture worth a thousand words? Neuroimaging in the Courtroom* (Baskin, et al., 2007) – which are all highly interesting topics and by extension also relevant to the paper, but which nevertheless would have derailed the focus of this paper. As such, an assessment of the five topics was made, which found them as having provided theoretical saturation regarding the proposed theoretical framework (Beach & Pedersen, 2019, pp. 155-157; Bryman, 2018, p. 688) – and thereby removing the need for an addition of further literature.

ANALYSIS

As detailed in the introduction of this paper, the communicative transference framework was synthesized using aspects of Luhmannian systems theory as well as Wittgensteinian linguistics, in order to generate a framework which could be understood as autopoietic, but which is dependent upon linguistic self-referential interpretations in the deontologization of observed irritants. Furthermore, and which has also been detailed in the introduction, a point was made that all systems have an internal capacity to both generate and deontologize *irritants* in their surrounding environment, resulting in a reactive communicative network of exposure to irritants. However, this capacity to engage with deontologization also places certain strain upon the communication transferred, in that it has to correspond to the internal structure of the observing system in order for it to be incorporated.

The theoretical presumption that a system could functionally operate via a process of deontologization of observed irritants, as based on linguistic self-referential interpretations, garnered inferential support via Gaboardi's argument that judges, lay judges, and juries, in combination with experts have to rely on scientific language in order to reach legal conclusions (2018, p. 15). Similarly, and as argued by Forret (2004) and Coen & Hefferman (2010), by engaging with nonjargon language and reducing the specific complexity of expert language, a greater acceptance was found within the recipient observing (legal) system (2004, p. 10; 2010, p. 197). Furthermore, and as pointed out by Koehler, the specific language used when transferring communication to the courts, can be the very difference between what seems confusing or helpful (2013, p. 515). As such, the way in which one might overcome the hurdle of linguistic self-referential interpretations when communicating with the legal system,

is via the application of judiciary-oriented language (Gaboardi, 2018, p. 16; Koehler, 2013, p. 537). This was made evident within both cases of the Small-N data, as the prosecutors' motion was structured on legal terminology and consequential arguments, whereas the Probation Service deviated from such standard to a varied degree. The Type I case demonstrated the Probation Services' capacity for applying a judiciary-oriented language, whereas the Type IV case did not. These two cases in turn had demonstrably different outcomes with regard to the communication made. Such outcomes also render support to Barth, Ryan & Hawks' argument that the transformation of scientific linguistics into arguments applicable within the courts, might have the unintended effect of generating a too rudimentary comment (1992, p. 255) – such as in the Type IV case. It should also be noted that, factors such as unfamiliarity with the topic or the complexity of the communication can have unexpected effects in confusing or misleading the triers of fact, as well as running the risk of producing aggravating rather than mitigating perceptions (Coen & Hefferman, 2010, p. 197; Lui, et al., 2019, p. 460; Koehler, 2013, pp. 516-517). This was something made evident by the Large-N data, which demonstrated that ADHD as a neuromedical concept, composing 27.6% of the total sample, generated a 60.6% Full-adherence-rate. While in contrast, Developmental disorder as a neuromedical concept, composing 0.9% of the total sample, generated a 50% No-adherence-rate. This was similarly demonstrated within the Large-N data with regard to the *sources of communication* in that the Probation Service, which composed 39.2% of the total sample, generated a 68.3% Full-adherence-rate, whilst the Forensic Psychiatric Opinion, composing 0.7% of the sample, generated a 100% No-adherence-rate. This data, in turn, speaks to two important facets, namely: 1) scientific linguistics is hard to transcribe into a judiciary-oriented language for the purpose of mutual understanding (Barth, et al., 1992, p. 255; Forret, 2004, p. 10; Coen & Hefferman, 2010, p. 197) – and 2) the sources of the communication share a responsibility with the legal system to attain a rudimentary understanding of how to best communicate with one another (Groscup, 2004, p. 59; Lopatka, 2016, p. 453; Rubinfeld & Cecil, 2018, p. 152; Taipale, 2019, p. 316).

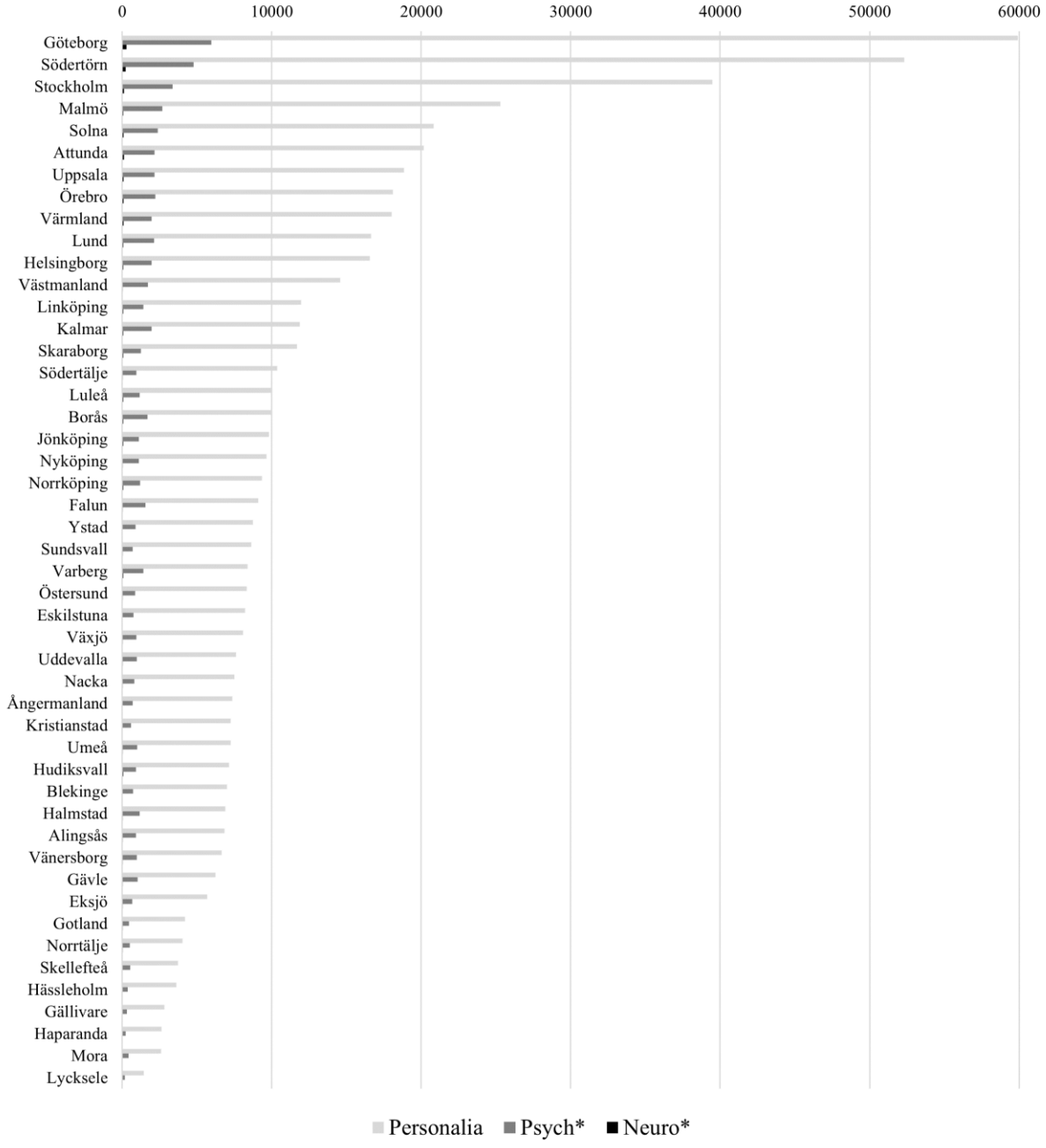
With regard to systems having an internal capacity to both generate and deontologize irritants in their surrounding environment, this is made evident by the sheer fact that neuroscientific evidence is presented as part of legal proceedings, while demonstrating an effect on the legal proceeding itself, as shown by the Type I case and the Large-N data. Similarly, and as noted by Baron & Sullivan, criminal law can be argued as rooted in folk psychology given its conceptualization of mental illnesses being due to disruptions of changes

within psychological states, rather than, and as previously argued, being connected to disruptions or changes within the neurological structures (2018, p. 338). Furthermore, and with regard to the deontologization of irritants (neuromedical communication), Lui et al. makes the point that neurological information has legal implications, especially with regard to arguments for rehabilitation and future dangerousness (2019, pp. 468-469). As such, and when considering this in relation to the comparison made between the Type I and Type IV case, the legal system's deontologization of the neuropsychiatric communication could be understood as having an influence on determining whether or not probation is a suitable penalty to pursue instead of imprisonment. Therefore, and in considering that deontologization of observed irritants occurs on a basis of linguistic self-referential interpretations, it is found to be of utmost importance that the irritation generated is oriented towards the internal structure of the recipient system, in order to reduce the risk of being misleading and unhelpful to the actors of the receiving system (Koehler, 2013, p. 537; Gaboardi, 2018, p. 16).

The bridging of the linguistic divide by orienting the language with which the communication occurs, thereby enables a risk reduction for judges and jurors favoring easier answers that might be wrong, over complex answers which might be correct (Lopatka, 2016, p. 449) – and thereby also ensuring that judges and juries can examine the scientific nature of the evidence at hand, whilst keeping its complexity in mind (Merlino, et al., 2008, p. 201). This linguistic engagement of judiciary-oriented language becomes even more evident in that the sources which had some sort of connection to the legal system (*see the red-marked sources in Large-N data table within the Appendix*) not only accounted for 81% of the total sample, but also accounted for 84.6% of all level-4 counts of adherence. To this point, Cashmore & Parkinson argue that judges and jurors are well aware of the importance of precise legal language (2014, p. 239) – which would not make it unreasonable to believe that sources with a connection to the legal system, also share such an understanding. Given such a presumption, that the communicative sources which have a connection to the legal system understand the value and importance of a judiciary-oriented language, there should be a notable increase in the number of cases regarding medical facts within law, as these communicative sources in turn can reasonably be expected to be influenced by other external systems. Considering this, and by referencing back to the data provided when the Large-N neuro* sample was collected (*see page 19 and Prevalence Data in Appendix*), we find the following distribution amongst the district courts of Sweden:

Figure 2.

Prevalence distribution of Personalia, Psych and Neuro* within the district courts of Sweden, 2012-2022.*



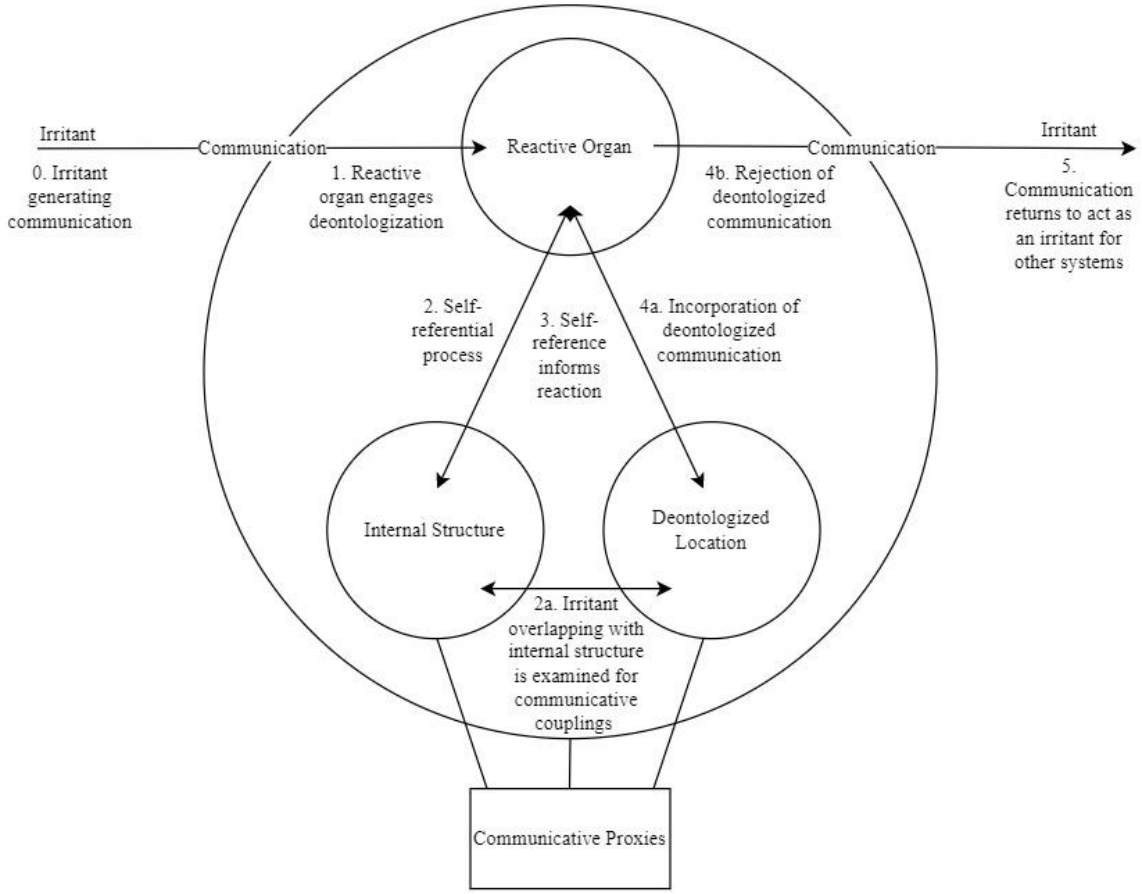
This distribution provides an insight into yet another two facets of the communicative transference taking place, namely temporality and spatiality. Firstly, temporality plays a unique part in that it makes clear the prevalence of certain kinds of evidence within the courts. Personalia for instance, refers to the personal circumstances of the defendant and is reviewed and present within all legal cases in Sweden (The Courts of Sweden, 2022) – which in turn is to be understood as a sociological aspect that has been present for so long that it has now become an ingrained part of the trial procedure. Similarly, as there has been a steady

progression of increased prevalence of psychology in law since the 1960s, and of neuroscientific evidence since the 1990s (Ireland, 2008, p. 117; Baron & Sullivan, 2018, p. 152) – this data also demonstrates a *lagging-behind* effect, wherein psycholegal prevalence is trying to catch up with the sociolegal prevalence, and neurolegal prevalence is trying to catch up with the psycholegal. Secondly, with regard to spatiality, this data demonstrates on a Large-N scale that deontologizing processes are recurrent throughout the district courts, and so also throughout the system of district courts of Sweden. Therefore, by reconciling that deontologization of observed irritants occurs on a basis of linguistic self-reference, with the fact that sources of communication which have a connection to the legal system generate an 84.6% level-4 account of adherence, yet another two facets of communicative transference are supported. The first being that of structural couplings, and the second being that of frequency of exposure (to communication from familiar sources) producing adherence. As demonstrated by the Large-N, Small-N, and previous literature, frequency of exposure to communication from familiar sources, which are able to bridge the medicolegal linguistic divide using a judiciary-oriented language, are also able to garner a higher degree of adherence in their communication with the legal system. This kind of systematic communication formulates the basis for a stable and predictive pattern of irritant and reactant relations, which in turn is the foundation for a structural coupling. However, as shown by the empirical data and previous literature, the way in which the communication occurs, is of equal importance to establishing a structural coupling of functional degree. The communicative system therefore needs to adhere, as theorized, in its communication, to that of the internal structure of the recipient system (Broström & Gewert, 2021, pp. 26-28). The structural coupling is therefore not a guarantee of attaining certain levels of adherence within the legal system, but rather acts as a vector with which direction and magnitude of adherence can be generally inferred.

As argued in the introduction of the analysis, the capacity to engage with deontologization also places certain strain upon the communication transferred, in that it has to correspond to the internal structure of the observing system in order for it to be incorporated. Similarly, as Merlino, et al. argue, there are practical examples of this kind of interaction in that judges' judicial responsibility is to ensure that the evidence heard within the courts, meet the admissibility standard for the jurisdiction (2008, p. 187). The judicial gatekeeping thereby functions as a practical *communicative proxy* for any and all communication made to the legal system, in that it enforces deontologization with the purpose of determining what, if any parts of the communication, should be incorporated. This is

similarly where Roberts highlights the special care and consideration the judicial system must give to intrasystematic communication, as the judicial gatekeepers are lacking in scientific competence (2008, pp. 459-460) – and so struggle with understanding the importance of scientific matters (Gaja, 2016, pp. 409-410; Gaboardi, 2018, pp. 10, 14). Yet, as Lopatka argues, and as have been made evident by the prevalence distribution in *Figure 2*, as well as by the Type I case and the Large-N data, the interactions between the legal system and intrasystematic sources ultimately leaves the legal system more scientifically literate than it was before (2016, p. 453) – causing the judicial gatekeepers, and so also the system, to attain a greater understanding of the scientific facts it engages with in a deontologization process. Therefore, when engaging with judicial gatekeepers, and in noting the importance of precise legal language, the frequency of exposure to communication from familiar sources making use of judiciary-oriented language in order to bridge the medicolegal linguistic divide, generates an overall higher level of adherence within the legal system (Cashmore & Parkinson, 2014, p. 239; Baron & Sullivan, 2018, p. 339; Lopatka, 2016, p. 436; Koehler, 2013, p. 537; Cecil, 2005, p. 74). This could be argued as true on two counts, and by referencing back to the previous literature. Firstly, by engaging with a judiciary-oriented language, the communicative source demonstrates a legal belonging, making it easier for triers of fact to compare the communication with legal statutes on a case-by-case basis, and so also to transcribe it into precise legal language (Gaboardi, 2018, p. 16; Coen & Hefferman, 2010, p. 197; Groscup, 2004, p. 59; Merlino, et al., 2008, pp. 187, 203). Secondly, by making use of a judiciary-oriented language when describing complex scientific facts, the communicative source reduces the chances of judicial gatekeepers relying on peripheral processing, counterfactual thinking, or heuristics, due to a lacking epistemic access (Lopatka, 2016, p. 445; Hans & Saks, 2018, p. 167; Gertner & Sanders, 2018, p. 139; Rubinfeld & Cecil, 2018, p. 152; Taipale, 2019, p. 316). Ultimately, this leads back to the issue of complexity and the linguistic divide between the communicative system and the legal system. The complexity of any communicatively transferred information is demonstrably bound not only by the frequency with which it is exposed to the recipient system, or by the prevalence of explanations or contextualizations, but also by the communicative system's capacity to traverse the medicolegal linguistic divide by means of applying judiciary-oriented language, by the prevalence of structural couplings, by the system's capacity to overcome the judicial gatekeeping process, and its ability to ensure that the information transferred is formatted in such a way that a central, rather than a peripheral, processing is likely to take place.

Figure 3.
Simple overview of communicative transference.



Having reviewed and analyzed the data in relation to the communicative transference framework, *Figure 3*, as seen above, provides a simple overview of the irritant and reactive organ interactions. It is important to note, that this figure is not a literal map of interactions when considering communicative transference. For instance, the irritant generating communication exists within its own system, and propels the communication into the surrounding environment of the legal system. The reactive organ (so crudely phrased) is the observational capacity of the legal system. As such, the legal system *notes* that there is an irritant in its surrounding environment, engages with deontologization of the irritant via self-reference and other-reference, in order to determine whether or not the irritant as a whole, its constituent parts, or nothing, should be incorporated into the system. The process of self-referencing is made via the reactive organ *self-referencing* its own internal structure, in order to determine whether or not the irritant can be deemed as having a belonging to the legal system, and if it does, the self-referential process continues by determining *what* belonging it has, by determining *where* it belongs (deontologized location). Thereafter, the reactive organ makes a 'summary judgement' of what, if any, parts of the communication should be

incorporated, and if so, where. Alternatively, the reactive organ finds that the irritant does not have a belonging within the internal structure of the system, and so the information is passed on without incorporation. As such, the communication does not actually enter into the system until the system has passed its judgement. Similarly, the communicative proxies are boundary regions which separate system from environment, and subsystem from intersystematic environment. Therefore, there exists no actual pathway between the irritant and the system inside of the proxy.

CONCLUSION

This paper has via broad application empirically tested and examined the theoretical framework of *Communicative Transference*, as proposed by Broström (2023a), with regard to its ability to 1) demonstrate communicative issues *within*, as well as *between*, systems, 2) that *frequency of exposure* leads to *adaptivity*, and that 3) *adaptivity given frequency of exposure* leads to greater *adherence*, despite complex transfers of communication. The examination and consequent tests of the communicative transference framework was done by applying a mixed method sequential explanatory design using a nested analysis of Large- and Small-N data, along with a systematic literature review. The Large-N data provided an insight into how frequency of exposure and unfamiliarity with neuromedical terminology can influence the adherence of the district courts with regard to outcome, which was also supported by the previous research, and explanatory of how communicative issues might occur between systems. The data also demonstrated how structurally coupled sources of communication, might have a better chance of communicating complex issues, due to the communicative system having a connection to the legal system. The Small-N data granted an in-depth perspective on the communicative issues which might occur within systems, and did so, by providing an understanding of how judiciary-oriented language and epistemic access to law, can come to influence the adherence of the legal system. The previous research provided inferential support in the analysis, ensuring that the results were understood in the context of prior research.

Hypotheses. Starting with that which is closest in memory, systematic adaptivity can be understood as adherence to communication of external sources which abide by communicative standards that are recognized by the internal structure of the recipient system, allowing for the formation of stable patterns of transference and consequent creation of structural couplings. The structural couplings can in turn be understood as the stable and predictive patterns of irritant and reactant relations, which provide an increased capacity in

the recipient system for adhering to greater communicative complexity. As such, the third hypothesis, arguing that: *Systematic adaptivity to intrasystematic communication results in the recipient system being capable of adhering to greater complexity from the same intrasystematic sources, given the frequency of exposure* – could therefore be understood as: *The legal system becomes more accepting of, and willing to adhere to, communication from structurally coupled sources which themselves adhere to a judiciary-oriented language in their communication of neuromedical facts.* This is in turn supported and made evident by the previous research, the Large- and Small-N data, the first and second hypotheses, and can as such be argued as *true*. Furthermore, and as demonstrated by the Large- and Small-N data, the frequency of exposure to communication from intrasystematic sources capable of bridging the medicolegal linguistic divide using judiciary-oriented language, produce a higher degree of adherence within the legal system. Therefore, the second hypothesis: *The greater the frequency of exposure to intrasystematic communication, the greater the adaptivity of a recipient system to new communication from the same source* – can be argued as *true* on the basis of the Large-N data along with previous research, but so also by the fact that frequency of exposure is the foundation by which structural couplings are made, which in turn renders the recipient (legal) system capable of adhering to greater communicative complexity. Considering this, the first hypothesis: *The greater the complexity of the communication from an external system, the lesser the degree to which the recipient system adheres to such communication* – can also be understood as *true,* given the results from the Large- and Small-N data, with the support of the previous literature, and an understanding of the second and third hypotheses. As argued in the analysis, the complexity of any communication is bound by several factors, amongst them the ability of the communicative system to format information in such a way that central, rather than peripheral processing is likely to occur, by the system's ability to overcome judicial gatekeepers, by the prevalence of structural couplings, by its capacity to employ judiciary-oriented language, by the presence of explanations or contextualizations, and by the frequency with which the recipient system is exposed to such communication. Summarily, by understanding that an increase of communicative complexity occurs when the communicative system is unable to overcome these factors, we also understand and find support for the first hypothesis to be true.

Research question. The research question of this paper was formulated as: *To what extent do the district courts of Sweden experience adaptivity to neurology* – and is answered via the three hypotheses. Because systematic adaptivity can be understood as adherence to

communication from external sources which abide by the communicative standards recognized by the internal structure of the recipient system, which in turn allows for the formation of stable patterns of transference and consequent creation of structural couplings, it is similarly understood that the structural couplings provide an increased capacity within the recipient system for adhering to greater communicative complexity, if the communicative system is capable of overcoming the communicative hindrances which generate the linguistic divide. This, as has been made evident, is supported by the Large- and Small-N data along with the previous research. Similarly, when reviewing the prevalence of personalia, psych* and neuro* within the district courts of Sweden for the period 2012-2022, a temporal aspect of such adaptivity is made evident. The sociological *personalia* is today fully integrated into the criminal legal procedure, and present within 100% of the cases, whereas psychology, having made its introduction to law in the 1960s, is present within only 11% of cases. The temporality of adaptivity can therefore be argued as such when turning to neurology, which made its introduction in the 1990s, finding it to be present within only 0.47% of the population. Therefore, considering that the courts of law were not designed to develop along the lines of technological advancements, the extent to which the district courts are adhering to neurology is lower than desired, while the adaptivity they experience is greater than expected.

Communicative transference. As argued, the purpose of this paper has been, via broad application, to empirically test and examine the theoretical framework of *Communicative Transference*, as proposed by Broström (2023a). It has been shown in answering the research question of this paper that the framework provides a solid basis for understanding how communication might be transferred between systems, with a varying degree of success dependent upon numerous factors. The empirical data and previous research supported the notion of deontologization in that the incoming communication (irritant) was reviewed in its entirety (through observation), resulting in a determination of what, if anything, should be incorporated into the legal system. This was particularly made evident by the Type I and Type IV cases. Similarly, the communicative proxy found support in the Large- and Small-N data, as well as in the previous research, in that sources of communication which were either structurally coupled or not, had a varying degree of success in generating adherence within the recipient system. In turn, the structural couplings found support in both the Large- and Small-N data, demonstrating that frequency of exposure leads to the generation of stable and predictive patterns of communication, which in turn also influenced the adherence to communication originating from the same sources. It was

similarly demonstrated by the data and previous research that language games play a central part for both complexity and adherence, which forms a sound conceptual link between the deontologization process and linguistic self-referential interpretations. As such, and considering these notions, it can reasonably be argued that systems, as part of the communicative transference framework, are autopoietic. The self-preservation of the legal system, is demonstrated via the Large- and Small-N data, in that the legal system acts and ensures that only legal circumstances are incorporated into the system, thereby and so also, preserving its own systematic function. In turn, the self-reproducing aspect of communicative transference systems, has been made evident in the presence of structural couplings. This highlights that information which is recurrent and has over time been integrated into the legal system, is also reproduced by the system. Nowhere is this more self-evident than in the full integration of the sociological *personalia* into criminal legal proceedings. Finally, it has been demonstrably shown, by both empirical data and previous research, that the systems within the communicative transference framework are, and function, as self-referential entities in their deontologization of irritants. As such, and therefore, it is concluded that the theoretical framework has found both immediate and inferential support via the empirical data and previous literature gathered, making it a feasible theoretical perspective for use in broad application. Systems evolution, i.e., adaptivity, can therefore be argued as the outcome of communicative transference.

DISCUSSION

A legal system which becomes more accepting of, and willing to adhere to, intrasystematic communication on the basis of structural couplings, experiences a systematic evolution, which can be explained and understood via communicative transference. With immediate support from empirical data, and strong inferential support from previous literature, the communicative transference framework has been used to provide a mechanistic explanation to the problem occurring within the intersection of scientific evidence and law, something which has been extensively argued in the previous literature to be lacking. The conclusions of this paper, that 1) the district courts of Sweden experience an adherence to neurology, greater than that which was expected to have been found, and 2) that systematic adaptivity to intrasystematic communication results in the recipient system being capable of adhering to greater complexity from the same intrasystematic sources, given frequency of exposure – suggest in accordance with the previous research, that the legal system, by maintaining a functional autopoiesis, is slowly developing into an *agora* of legal and

scientific ideas. However, these conclusions provide little to no insight into the issue of ever-increasing complexity regarding scientific and legal advancements, which undoubtedly generate a larger divide between the fields. And so, it is important to discuss the practical implications for these findings with regard to the *current state* of legal and scientific interactions. *Firstly*, and with regard to both the positive and negative aspects for sources which are *not yet* structurally coupled. These findings can provide a map of sorts, highlighting effective communicative strategies for enabling positive responses from the legal system in its deontologization. However, these findings may also prompt *non-coupled* sources to engage with a judiciary-oriented language they do not yet master, and so also, in accordance with the arguments made in the previous literature, remove meaningful interpretations from the complex scientific data. Thereby also increasing the risk for judges, lay judges, and juries having to make legal decisions in the dark, alternatively causing them to freeride on an already judiciary-oriented scientific explanation. *Secondly*, with regard to the positive and negative aspects for sources which *are* structurally coupled. The already structurally coupled sources, such as the Probation Service, may use these findings to better understand how their communication is influencing triers of fact. This would in turn allow them to engage with more in-depth mechanistic explanations of the relation between the neuromedical terminology and its effects, making use of the coupled relation, and formatting their communication in accordance with the judiciary language. However, there are negative aspects to these findings for structurally coupled sources as well. Given that these sources are already coupled, it may be incentivizing to rely more so on the judiciary-oriented language, than to explain the mechanistic relationship, due to the understanding that their communication will have a relatively better impact than from non-coupled sources. Similarly, and as an example, if a person at the Probation Service is writing an opinion to the court but does not have a background or education regarding the neuromedical terminology they are referencing as a cause of a particular behavior, a reliance on judiciary arguments might mislead the triers of fact, causing them to base their decisions on false foundations. Structurally coupled sources must therefore ensure that their communication does not unnecessarily influence the triers of fact. *Thirdly*, regarding the positive and negative aspects for sources which have yet to enter into the scientific and legal agora. These findings may support sources, which by default are deemed as non-coupled but which have yet to communicate with the legal system, in establishing a basis for communication. As such, these findings may further support an increase of scientific variety within the courts, demonstrating that by overcoming the

communicative hindrances, evidence of varied complexity and sort may be entered for consideration. The negative aspects of these findings, and in relation to the establishment of a basis of communication, is the opening of the proverbial floodgates. By providing a basis for communication, sources which are yet structurally coupled may structure their communication in a judiciary-oriented fashion, making it easier for information which might not be of relevance to the court, nevertheless be entered into the legal proceeding as part of the *free evidentiary examination*. Ultimately, if abused, resulting in a flooding of the legal system with reductionistic evidence to such a degree that the deontologization process is unable to recognize legal from scientific fact. However, these findings are *most* likely to have a practical implication of informing structurally coupled sources, as well as non-coupled sources, on how to better communicate with the legal system, increasing linguistic cooperation between systems.

Beside practical implications of the findings, it is also important to have a brief discussion on the results which deviated from expected findings. As shown and argued, there was a conflict between the first hypothesis and the Large-N data collected, wherein *complexity,* as a construct, only explained 4.78% of the variance in *adherence*. These results were not only contradictory to the presumptions of the paper, but to that of the previous research as well, having clearly stated that increased complexity of scientific evidence is expected to result in a reduction of adherence to such evidence. The initial presumption that complexity was bound by explanations, contextualizations, and the frequency with which the recipient system is exposed to such communication, was not proven to be wrong, but rather proven to be lacking in its explanatory power. As demonstrated by the Small-N data and the previous research, aspects such as capacity to employ judiciary-oriented language, the prevalence of structural couplings, the ability to overcome judicial gatekeepers, and the ability to format the communication in such a way that central, rather than peripheral processing is likely to occur, were also of high importance to understand the complexity of transferred communication. As such, the initial presumption of complexity was given additional explanatory power by the Small-N and previous research, enabling a more well-structured and sound argument with regard to complexity, which thereafter came to support the hypothesis by aid of the previous research. It can, however, still be argued that complexity as such, remains a black-box phenomena, containing more variables than accounted for, even when considering the additions of the Small-N and previous research. Of note, while both adherence and structural couplings found support in previous research and in the Large- and

Small-N data, neither were necessarily supported by the argument of complexity. Therefore, in arguing that the 2nd and 3rd hypothesis are true on the basis of the data gathered, inferential support could be offered to the 1st hypothesis on a similar basis. This in turn provided both a theoretically and empirically supported position from which it could be argued that frequency of exposure leads to adaptivity, and that adaptivity leads to adherence, with the hindrance to adaptivity and adherence being that of complexity.

Limitations. This study has had three main limitations. *The first* limitation regards the construct of complexity. As the construct provided little to no explanation regarding the levels of adherence in its initial stage, it similarly provided little assistance for understanding the relationship between complexity and adherence within the Large-N data. However, as has been shown, the conclusions, hypotheses, and research question, have all been answered or supported by the Large- and Small-N data, as well as by the previous research. This, in of itself, places certain emphasis on the fact that the limitations presented by the construct, have not been obstructive to such a degree, or presented enough of an issue, that the paper could not be completed on time. *The second* limitation regards the limitation of data. Given that this paper at the outset was to analyze 735 legal cases, out of which only 150 cases were ultimately analyzed, data-limitation has to be argued as a point of limitation for the paper in its entirety. Of note is that *time* was not a constraining factor in this regard, but because the paper engaged with continuous comparisons of the gathered Large-N data, the limitations of the Large-N sample, pertaining to complexity, was found earlier in the data collection process. This allowed for the adoption of a nested analysis approach, combining Large- and Small-N data for a more nuanced analysis, which merged the overarching purview of Large-N data with the in-depth investigation of Small-N data. The choice of leaving the remaining 585 cases out of the final sample, was made in favor of identifying empirical fingerprints of communicative transference and in favor of defining boundary thresholds of the framework via the nested analysis. Finally, *the third* limitation regards confounding factors. Due to the adoption of an in-depth analysis of the Type I and Type IV cases selected, the number of confounding factors with regard to adherence increased substantially. Herein, factors such as age, gender, education, political affiliation, and background, along with other factors came into play for the judges and lay judges, all of which are factors capable of influencing the adherence to different arguments in various ways. However, these factors played an equal, if not similar, part within the Large-N data, but were deemed as not being significant to the argument at hand. Because this paper has been interested in how exposure to certain

communication influences and ultimately forces a recipient system to become adaptive to such communication, these factors are of little to no importance when the attempt is to make a generalized statement of law-bound regularities for such relations. Granted, these factors do play a significant role in understanding adherence on a case-by-case basis but are not deemed as playing such a part within the framework, which is why they were excluded from both the Large- and Small-N data.

Future research. With regard to future research, there are four considerations to be made. *Firstly,* future research could focus on answering the aspects which have gone unanswered in this paper. For instance, the influence of the confounding factors in explaining adherence on a case-by-case basis. Such a study could be conducted using qualitative in-depth analysis of a comparative nature, using Type I and Type IV cases. This would allow for the identification of empirical fingerprints which bind the Type I cases together, as well as empirical fingerprints which bind the Type IV cases together, prior to engaging with a comparative analysis to determine various thresholds. Such a study would bring about a greater understanding of how minor and commonly overlooked factors, might act as causal conditions, leading to a particular verdict or outcome. *Secondly,* future research could focus on the limitations as presented in this study regarding the influence of complexity. The aim of such a study could be to determine how complexity, as part of the communicative transference and consequent adaptivity of a recipient system, is influencing levels of adherence. Furthermore, such a study could advantageously make use of a mixed method sequential explanatory design, utilizing nested analysis. Seeing as how complexity, as it is now understood, can be perceived of as a mixed measurement phenomenon, i.e., appearing in both qualitative and quantitative measurements, exploring both the qualitative and quantitative aspects of complexity would most likely provide a greater understanding of how it influences adaptivity and adherence in the transference of communication. *Thirdly,* future research projects could focus on a differentiation in location, culture, and context. By conducting a similar study in a different location, i.e., another country (which still retains the same legal system), a difference regarding the progression of legal adaptivity to neurology could be found between the Swedish legal system and, for instance, the Norwegian legal system. Similarly, differences in degree of adherence might be found when changing from a civil law system, such as Sweden, to that of a common law system, such as England. Furthermore, by changing the culture within which the research takes place, additional changes to adaptivity and adherence might be found. As such, future research could focus on

conducting comparative studies within the Swedish legal system, but with regard to the appellate courts, as there might be a difference in judicial culture influencing how neuromedical terminology is interpreted and thereby also incorporated. *Lastly,* future research could attempt to address the empirical fingerprints left behind by the communicative transference process in greater detail, alternatively assist in developing the framework as a whole by engaging with some of the suggested research above.

Concluding thoughts. This paper has delved into the intersection of neuroscientific evidence and law, specifically with regard to the communication of neuroscientific evidence in the district courts of Sweden. By analyzing Large- and Small-N data, it has been shown that while the transference of neuroscientific evidence into courts of law is recurrent, it is not yet a precise science. Numerous factors influence and impact the interpretation and application of the neuroscientific evidence, amongst them the linguistic barriers and the complexity of the communication itself. As such, one of the key findings in this paper is the importance of an interdisciplinary collaboration between medical and legal experts. By engaging with a collective collaboration, it would be possible to develop a shared language of sorts, overcoming the linguistic divide which separates the fields, and which would ultimately enable cross-disciplinary understanding. Such a collaboration would enable the use of neuroscientific evidence as part of the legal proceeding, without running the risk of being confusing or misleading the triers of fact. However, as argued in the previous research, cross-disciplinary understanding is hard to attain as it takes years of practice to attain neuroscientific understanding, as a fact which is equally true with regard to legal understanding. Therefore, there exists a foundational need to be transparent with regard to the foundation of legal and scientific method and practice, in order to enable an advancement of understanding within both fields. Given that neither law nor neuroscience is likely to suddenly stop advancing, it is imperative that both theoretical and practical considerations are put into place, teaching neuroscientists about law, and legal professionals about science. Such a collaboration could take on numerous forms, ranging from academic and theoretical, to practical joint training sessions. Despite that a two-hour session in neuroscientific methods is not likely to make any legal professional a neuroscientist, just as a two-hour session in legal procedure will not make a neuroscientist a legal professional, it is imperative for the continuation of admitting neuroscientific evidence into court, that such exchanges start to take place at a greater extent than they currently are. This does however present me, as the author

of this paper, with a question that needs to be answered, namely: Why should neuroscientific issues and their relationship to legal procedure interest sociologists of law in the slightest?

To answer this question, it is important to initially state that Sociology of Law has long been concerned with the study of how both legal institutions and law have an impact on society and social life. However, and much to my chagrin, Sociology of Law has largely ignored the role of biology and neuroscience when reviewing the legal impact on social life, focusing the majority of its scholarly purview on social-, cultural-, economic-, and power-relations. As a result, there is only a limited understanding of the complex interplay between the law and the brain. Yet, via the incorporation of the brain and its influence on legal decision-making, alternatively how knowledge about the brain influences the way in which we choose to apply and understand our laws, Sociology of Law holds the potential of developing a more comprehensive understanding of how the legal system might have an impact on social life and society at large. As demonstrated in this paper, the complex relationship between communicative parties ultimately highlights the importance of how the use of a neuroscientific and judiciary-oriented language, can shape and influence legal outcomes. Furthermore, as provided by the insights of this paper, there is a significant and growing issue in many legal systems around the world that neuroscientific evidence and understanding either clash or outpace the legal conceptualizations, leaving Sociology of Law in a relatively unique position. By engaging with the lens offered by Neurolaw, sociologists of law would be able to examine the biological and neurological factors that shape legal decision-making and legal reasoning, in all parties subjected to the law. This means, in essence, that sociologists of law are in the fascinatingly exciting position of researching not only how neurology influences the way in which we interpret and apply law, and thereby influence the social life of others, but also examine how neurology influences a judges' decision-making capacity in applying the law on others, or similarly whether or not a defendant can be subjected to the law, based on his or her neurological circumstances. While some reservation might be needed, given that Neurolaw is a relatively new area of research, having only gained attention in the last decade, its multidisciplinary purview of brain and legal relations presents Sociology of Law with a unique opportunity to expand its current borders of research. Furthermore, the incorporation of Sociology of Law and Neurolaw into a common field of research would undoubtedly enable the development of interdisciplinary research programs, enable the development of new research methodologies and tools, as well as encourage collaboration between legal scholars, sociologists of law, and neuroscientists,

providing new frontiers and challenges to be overcome. Admittedly, this sounds good and well in theory, and so a practical neurosociolegal example is warranted.

Sociology of Law stand to offer insights regarding the ethical implications of integrating neuroscientific evidence into legal procedure, especially in cases regarding the concept of mens rea, i.e., guilty mindset. Today, subjective determinations govern the determinations of mens rea via examination of evidence regarding statements, defendant's actions, and the subjective and objective requisites at hand. However, as neuroscience and neuroscientific techniques continue to develop, it may be possible to determine a defendant's mental state more accurately through brain function, i.e., via objective measurements. By incorporating objective measurements of neuroscientific evidence into the determination of mens rea, the legal system could arguably become more just, as it would be able to provide a more accurate assessment of a defendant's mental state at the time of the crime. It is in the examination of neurocognitive processes that Neurolaw can provide a deeper understanding of how both insight and intent can be influenced by factors beyond the defendant's control. However, this raises the question of legal fairness, especially if the action of the defendant had been influenced by factors beyond their control. Sociology of Law, with its focus on the social impact of legal institutions, would be able to engage with the role of exploring these ethical implications of such neuroscientific evidence. Furthermore, sociologists of law can identify potential biases and inconsistencies within the legal system, as well as explore how the use of such neuroscientific evidence may affect public perceptions of justice and fairness. As previously demonstrated, there already exists a reluctance to introduce too much neuroscientific evidence into court, due to the influence it has on the judges' and jurors' perception of the defendant. Therefore, there exists ample room for sociologists of law to examine the potential impact of neuroscientific evidence in legal procedure, how this evidence comes to influence social perception, and how it may intersect with existing power relations. For it is in the examination of how neuroscience and law intersect, that Sociology of Law can contribute to a deeper understanding of how both law and legal institutions impact society and social life, thereby rendering an understanding of how we can work towards a more fair and just legal system. This paper therefore takes comfort in having contributed to the field of Sociology of Law, in that it has explored how neuromedical communication influences and impacts legal decision-making in the district courts of Sweden, thereby shedding light on a relatively overlooked issue in Sociology of Law, as well as suggesting a path forward for future research.

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APPENDIX: *Codification schedule*

Source of Communication	**Yes**	**No**
§ 7 in law (1991:2014) on special investigations in criminal cases		
Expert witness		
Regular witness		
Defendant		
Plaintiff		
Family member		
Government agency:		
Other:		

Transferred Communication	
Information	
Focus Word	
Dimension (main)	
Dimension (sub)	
Information code length	

Statement Complexity set	**0-100**	**Yes**	**No**
Frequency of Focus word		*N/A*	*N/A*
Explanation of Focus word	*N/A*		
Context regarding Focus word	*N/A*		

Grading Statement Complexity	**Yes**	**No**	**Numeric**
Very Low Complexity			1
Below Average Complexity			2
Average Complexity			3
Above Average Complexity			4
Very High Complexity			5

Statement Adherence set	**Yes**	**No**	**Numeric**
Motion			1
Grounds for Decision			2
Sentencing			3

Is the verdict based on communicated factors?	**Yes**	**No**	**Numeric**
N/A			4
Is the communication disregarded in the sentencing?	**Yes**	**No**	**Numeric**
N/A			0

Grading Statement Adherence	**Yes**	**No**	**Numeric**
No Adherence			0
Low Adherence			1
Medium Adherence			2
High Adherence			3
Full Adherence			4

APPENDIX: *Codification schedule with explanations*

Source of Communication:

- § 7 in law (1991:2014) on special investigations in criminal cases: [Y/N]
- Expert: [Y/N]
- Witness: [Y/N]
- Defendant: [Y/N]
- Plaintiff: [Y/N]
- Family member: [Y/N]
- Government agency: [Y/N]
- [1]Other [Y/N]
    - Source:

Transferred Communication:

- [2]Information:
- [3]Focus word:
- [4]Dimension (main):
- Dimension (sub):
- [5]Information code length:

Statement Complexity set:

- [6]Frequency of Focus word: [0-100]
- [7]Explanation of Focus word: [Y/N]
- [8]Context regarding Focus word: [Y/N]

[1] *Other* enables the addition of new sources of communication, i.e., those sources which have yet been identified as part of the list above, but which nevertheless might be relevant sources, while the material is being reviewed.
[2] *Information* pertains to the sentence-strings regarding the defendants' factual neuro* circumstances, as they are described within the courts' documents.
[3] The *Focus word* is that which pertains specifically to the neuro* circumstances of the defendant, which is summarized by medico-specific terminology, such as, and as an example: *encephalopathy, neuroleptics, hemodynamic responses, aphasia, Alzheimer, degeneration, visuospatial,* and so on.
[4] The *Dimension (main)* regards the primary sphere of communication which is attempting to transfer information from its own field to that of law. As an example, the Focus word *neuroleptics*, which is a psychopharmacological drug distributed amongst Schizophrenic patients, would have *Medical* as a main dimension, and *Pharmaceutical* as *Dimension (sub)*. Of note, given the selected sample, most if not all main dimensions will be Medical.
[5] *Information code length* pertains to the *number of words* within the aforementioned sentence-strings regarding the defendants' factual neuro* circumstances. By coding the length of the communication in terms of how many *words* the sentence-strings contain, an estimate of how much thought and space is given to neuro* arguments overall within the legal documents can be made.
[6] The frequency (F) of the focus word (x) is determined by its prevalence (p) within the sample (S) over time (t), which is expressed by the following equation: [$F(x) = S(p) / t$], providing a 1-100 percentage scale of prevalence.
[7] The question regarding *Explanation* pertains to whether or not an explanation of the Focus word has been granted as part of the *information* transferred between the systems.
[8] The question regarding *Context* pertains to whether or not a context has been provided as part of the *information* transferred between the systems.

[9]Grading Statement Complexity:

- [10]Very Low Complexity [Y/N] → [1]
- Below Average Complexity [Y/N] → [2]
- Average Complexity [Y/N] → [3]
- Above Average Complexity [Y/N] → [4]
- Very High Complexity [Y/N] → [5]

Statement Adherence set:

- [11]Motion [Y/N]
- Grounds for Decision [Y/N]
- Sentencing [Y/N]
- [12]Is the verdict based on communicated factors? [Y/N]
- [13]Is the communication disregarded in the sentencing? [Y/N]

[14]Grading Statement Adherence:

- No Adherence [Y/N] → [0]
- Low Adherence [Y/N] → [1]
- Medium Adherence [Y/N] → [2]
- High Adherence [Y/N] → [3]
- Full Adherence [Y/N] → [4]

[9] For a detailed review of how the 5-point Likert Scale was created for *Statement Complexity*, please review the *Creation of 5-point Likert Scale for grading statement complexity* below.

[10] Statement complexity is determined by the *number* of factors present within the Statement Complexity set. As an example, given that the frequency by which the Focus word is *low* (< 5%) and that there are no *Explanations* or *Contextualizations*, the complexity of the statement is deemed as having *Very High Complexity*. Similarly, if the frequency by which the Focus word is *high* (> 15%) and there are both *Explanations* and *Contextualizations* provided, the complexity of the statement is deemed as having *Very Low Complexity*.

[11] *Motion* refers to whether or not the neuro* communication takes place within the motion of the court proceeding as documented within the legal transcript. This is similar for both *Grounds for Decision* and *Sentencing*.

[12] Whether or not the verdict is based on communicated factors is determined by the legal communication in the sentencing, i.e., by whether or not the court argues, within the legal transcript regarding the sentencing, that the final verdict is reduced or altered in any way due to the courts understanding of the neuro* circumstances at hand.

[13] A disregard for the communication made can be noted when the court, in its deliberation (within the court transcripts), argues that the factual neuro* circumstances of the defendant *does not have a bearing* on the case.

[14] In brief, it can be said and argued that the *Statement Adherence set* corresponds to the different grading levels of adherence. For instance, *Motion* is equivalent to *Low adherence*, *Grounds for Decision* is equivalent to *Medium Adherence*, and so on. This is why a numeric-table has been included with the *Codification Schedule* under the section of *Statement Adherence set*, enabling the researcher to move the identified numeric from within the *Statement Adherence set* to the Likert Scale for *Grading Statement Adherence.* For a detailed review as to why these two are corresponding to each other, and of how the 5-point Likert Scale was created, please review *Creation of 5-point Likert Scale for grading statement adherence* below.

APPENDIX: *Creation of 5-point Likert Scale for grading statement complexity*

This paper has made use of a 5-point Likert Scale in grading the statement complexity of an incoming communication from the medical field to that of the legal field. By initially codifying *Statement Complexity* as its own individual set, containing 1) Frequency of Focus Word, 2) Explanation of Focus word, and 3) Context regarding Focus word, a grading scale was developed using an APO-module. Initially, and as *Frequency of Focus Word* was determined as a distributive scale ranging from 0-100, given the distribution equation [F(x) = S(p) / t], it was deemed reasonable to divide the distribution into three separate samples signifying a *low*, *medium*, and *high* frequency. Given the likely large number of neuromedical terminology which might occur within the sample, terminology which occurred within *less* than 5% of the sample was deemed as having a *low frequency* (< 5%). Terminology which in turn occurred within the range of 5-15% of the sample was deemed as having a *medium frequency* (5-15%). Finally, terminology which had a *greater* occurrence than 15% was deemed as being of *high frequency* (> 15%). The choice to assign the lowest number to the highest frequency (*as seen in the APO-module*) and vice versa, was due to the principle of osmosis, i.e., the gradual and/or unconscious assimilation of ideas or knowledge. Furthermore, considering that Focus Words which occur within the bottom 5% of the sample are expected to be harder to grasp, given their relatively low rate of exposure, this was deemed as a good approach. Thereafter, and given that both *Exposure* and *Contextualization* provides a dichotomous [1, 0] relation, a total number of 4*3 iterations could be determined. which are described and numbered in the All-Possible-Orders-Module (APO) below:

Table X
APO-module

	Low Freq.	**Mid Freq.**	**High Freq.**
Yes CON, Yes EXP	3	2	1
Yes CON, No EXP	4	3	2
No CON, Yes EXP	4	3	2
No CON, No EXP	5	4	3

As can be seen in the APO-module, an assignment of 1 or 0 was made to both *Explanation* and *Contextualization* given their dichotomous relation to being present or not. Given the presumption that an *Explanation* of a Focus word does not add to complexity, and the same being true for a *Contextualization* of said Focus word, both were assigned their 0-state value when the answer "Yes" was provided. Similarly, when the answer "No" was provided, both were assigned a numeric value of 1. This resulted in a 5-point Likert Scale by which a Grading of Statement Complexity could be made. Incidentally, the APO-Module provided an interesting bell curve in its distribution which can be seen in the table below.

Table X

Likert 5-point scale for grading complexity

Very Low Complexity	**Below Average Complexity**	**Average Complexity**	**Above Average Complexity**	**Very High Complexity**
HIGH FREQ. + YES CON. + YES EXP.	HIGH FREQ. + YES CON. + NO EXP HIGH FREQ. + NO CON. + YES EXP. MED. FREQ. + YES CON. + YES EXP.	HIGH FREQ. + NO CON. + NO EXP. MED FREQ. + YES CON. + NO EXP. MED FREQ. + NO CON. + YES EXP. LOW FREQ. + YES CON. + YES EXP.	MED FREQ. + NO CON. + NO EXP. LOW FREQ. + YES CON. + NO EXP. LOW FREQ. + NO CON. + YES EXP.	LOW FREQ. + NO CON. + NO EXP.
Numeric Grade: 1	Numeric Grade: 2	Numeric Grade: 3	Numeric Grade: 4	Numeric Grade: 5

APPENDIX: *Creation of 5-point Likert Scale for grading statement adherence*

In determining the grading of *Statement Adherence*, considerable thought had to be given to how the answers of "Yes" and "No" was to be numerically graded. This was eventually overcome by making use the of hierarchical structures within the court proceedings themselves. This means that by making use of the Swedish court procedure in criminal litigation: *Introduction of main hearing*, *Questioning*, and *Conclusion of main hearing* – it was made possible to assign numeric relevancy to wherein the communication had been referenced. For instance, as part of the Introduction of main hearing, the prosecutor is allowed to describe in detail the offenses of the case at hand, which is also known as *Statement of facts.* Herein, a reference might occur to the defendants factual neuro* circumstances, should the prosecutor wish to argue such circumstances as *aggravating*. However, should the court in their transcripts of the case *not* reference back to these circumstances, it is presumed that the communication of factual neuro* circumstances were lost or overlooked. As such, the numeric grade for such communication is represented by the number (1). Should the communication of the factual neuro* circumstances of the defendant either *reoccur* or be *introduced* within the second part of the court procedure, *questioning*, the communication would be deemed as having a higher numeric grade and relevancy for possible adherence for the court. Furthermore, the second stage of the criminal court case proceeding, *questioning*, also adds to the courts considerations when reviewing and determining the *grounds for decision*. Therefore, the numeric grade for communication which occurs within the second stage of the criminal procedure is determined as by the number (2).

The third stage of the court procedure, *Conclusion of main hearing*, pertains to the review of the defendants' personal circumstances, the prosecutors' and defense counsels' closing arguments, and the court's deliberation of the evidence at hand. Herein, and again, both the prosecutor and defense counsel have the opportunity to argue the factual neuro* circumstances of the defendant as either mitigating or aggravating circumstances to the offenses at hand. These arguments, together with the evidence at hand, constitute the grounds for deliberation with regard to *sentencing*. Therefore, should the factual neuro* circumstances of the defendant be present within the section wherein the court deliberates on *sentencing,* it should be perceived of as having a higher relevancy than that which is reviewed within either the *Introduction of main hearing* or within the *Questioning.* As such, the numeric grade assigned to the neuro* communication occurring within the *Conclusion of main hearing* or within the section pertaining to *sentencing,* is determined as by the number (3).

There are however two more aspects to consider when determining relevancy of the communication to the adherence of the court. The first being when the court argues that the verdict being handed down is dependent upon the neuro* communication delivered within court proceeding. Should the circumstances be as such, then the verdict handed down could be understand as *Fully* adhering to the communication made within the case. As such, the highest numeric grade for adherence is determined as by the number (4). On the opposite end however, there is the possibility that the court in its deliberation (within the court transcripts) makes no mention whatsoever with regard to the factual neuro* circumstances of the defendant, alternatively, the court argues the sentencing with a disregard of the communication at hand, thereby delivering a sentence which is incoherent with the communication made. As such, verdicts which are disregarding the communication at hand are deemed as having *No* adherence and are granted the numeric grade (0). Finally, the numeric relationship between the communication made and the adherence of the court to such communication, can be viewed and understood as follows:

Given: Communication (A) argues (→) Outcome B given (|) Factor [C]

$$[\ Com._{(A)} \rightarrow Outcome_{(B)} \mid C\ ]$$

Then: Adherence = The grade by which the court 1) incorporates the communicated factor into a) the motion, b) grounds for decision, and c) sentencing; 2) Bases the verdict on the communicated factors [C], and 3) Disregards the communication [C] in sentencing.

$$[\ Adher._{(Com)} = Incorp._{[Mot,\ Ground,\ Sent]} + Ver._{[C]} + Disreg._{[C]}\ ]$$

This operationalization of *adherence* thereafter led to the creation of a set by which a numeric grade could be assigned to each of the legal cases being reviewed. The considerations of the set were fairly simple in arguing their relevancy by order of dignity, i.e., that the higher numeric grade found within any of the legal cases always holds firm, irrespective of there being missing underlying orders. For instance, if a legal case were to review a defendant's factual neuro* circumstances within *Sentencing*, the numeric grade for adherence would be determined as (3), irrespectively of whether or not a reference to such circumstances had been made as part of the *motion* or *grounds for decision.* This shows very well in the extremes of the table in that a verdict which is *based* on communicated factors receive the numeric grade (4), whereas if the *communication is disregarded* as part of sentencing it receives the numeric

grade of (0). As such, it is always the highest order of dignity which determines the numeric grade of the case at hand. Again, if the communication has been incorporated into either the *Motion* or *Grounds for Decision* but is *argued as not having any bearing on the sentence*, the *Adherence* is thusly determined as 0.

Table X
Statement Adherence set

Incorporated Communication	**Yes**	**No**
Motion (1)		
Grounds for Decision (2)		
Sentencing (3)		

Is the verdict based on communicated factors?	**Yes**	**No**
Numeric Grade: 4		

Is the communication disregarded in the sentencing?	**Yes**	**No**
Numeric Grade: 0		

The Likert 5-point scale which was developed after having assigned numeric grades to each of the determining factors, was made to reflect the grading for an easier interpretation. As such, a simple conversion was made into the following scale for grading statement adherence.

Table X
Likert 5-point scale for grading adherence

No Adherence	**Low Adherence**	**Medium Adherence**	**High Adherence**	**Full Adherence**
Disreg.[C]	Incorp.[Mot]	Incorp.[Ground]	Incorp.[Sent]	Ver.[C]
Numeric Grade: 0	Numeric Grade: 1	Numeric Grade: 2	Numeric Grade: 3	Numeric Grade: 4

APPENDIX: *Large-N data*

Frequencies of *Source*

Levels	Counts*	% of Total	Cumulative %
Probation Service	**60**	**39.2 %**	**39.2 %**
Personal examination	**18**	**11.8 %**	**51 %**
Prison & Probation Service	**16**	**10.5 %**	**61.5 %**
§ 7 in (1991:2014)**	**12**	**7.8 %**	**69.3 %**
Social Services	**12**	**7.8 %**	**77.1 %**
Unspecified	6	3.9 %	81 %
Neuropsychiatric opinion	5	3.3 %	84.3 %
Forensic Psychiatric Examination	4	2.6 %	86.9 %
Neuropsychiatric examination	4	2.6 %	89.5 %
Neuropsychiatric Examination	3	2.0 %	91.5 %
Municipality	**3**	**2.0 %**	**93.5 %**
HVB Accommodation	**2**	**1.3 %**	**94.8 %**
Personal Examination	2	1.3 %	96.1 %
Expert Witness	2	1.3 %	97.4 %
Psychologist's Statement	1	0.7 %	98,1 %
Forensic Psychiatric Opinion	1	0.7 %	98.8 %
Forensic psychiatric examination	1	0.7 %	99.5 %
Courts' observation	**1**	**0.7 %**	**100.2 %**

** Each count corresponds to roughly 0.653*
** N = 153*
*** § 7 in (1991:2014) is not a legal institution but constructed solely on legal communication*

Frequencies of *Source*

Source	Adherence*/**				
	0	1	2	3	4
Probation Service	**1**	**0**	**2**	**16**	**41**
Social Services	**0**	**0**	**1**	**2**	**9**
§ 7 in (1991:2014)	**0**	**0**	**1**	**2**	**9**
Prison & Probation Service	**1**	**0**	**3**	**4**	**8**
Personal examination	**0**	**0**	**3**	**9**	**6**
Neuropsychiatric opinion	1	0	0	0	4
Neuropsychiatric Examination	0	0	0	0	3
Unspecified	0	0	3	1	2
HVB Accommodation	**0**	**0**	**0**	**0**	**2**
Forensic Psychiatric Examination	1	0	0	1	2
Municipality	**0**	**0**	**0**	**2**	**1**
Neuropsychiatric examination	0	0	1	2	1
Forensic psychiatric examination	0	0	0	0	1
Courts' observation	**0**	**0**	**0**	**0**	**1**
Personal Examination	0	1	0	0	1
Expert Witness	0	0	1	1	0
Psychologist's Statement	0	0	1	0	0
Forensic Psychiatric Opinion	1	0	0	0	0

** Probation Service, Social Service, § 7, Prison & Probation Service, and Personal Examination account for (N = 109) 71% of all cases*
*** Generated level of adherence compared to communicative source*

Frequencies of *Source*

Source	Complexity*				
	1	2	3	4	5
Probation Service	**0**	**2**	**24**	**9**	**25**
§ 7 in (1991:2014)	**0**	**0**	**1**	**4**	**7**
Personal examination	**0**	**0**	**7**	**4**	**7**
Prison & Probation Service	**0**	**0**	**9**	**3**	**4**
Neuropsychiatric opinion	0	0	1	0	4
Social Services	**0**	**0**	**7**	**2**	**3**
Neuropsychiatric examination	0	1	0	0	3
Unspecified	0	1	1	2	2
Neuropsychiatric Examination	0	0	0	2	1
Forensic Psychiatric Examination	0	1	0	2	1
Personal Examination	0	0	0	1	1
Courts' observation	**0**	**0**	**0**	**0**	**1**
Municipality	**0**	**1**	**1**	**1**	**0**
HVB Accommodation	**1**	**0**	**0**	**1**	**0**
Expert Witness	0	0	2	0	0
Forensic psychiatric examination	0	0	1	0	0
Forensic Psychiatric Opinion	1	0	0	0	0
Psychologist's Statement	1	0	0	0	0

** Complexity of communication transferred per communicative source*

Frequencies of *Focus Word*

Levels*	Counts**	% of Total	Cumulative %
ADHD	**61**	**27.6 %**	**27.6 %**
Neuropsychiatric disability	**14**	**6.3 %**	**33.9 %**
Asperger's syndrome	**13**	**5.9 %**	**39,8 %**
Neuropsychiatric diagnosis	9	4.1 %	43.9 %
Mental illness	8	3.6 %	47.5 %
Neuropsychiatric problem	7	3.2 %	50.7 %
ADD	6	2.7 %	53.4 %
Autism	6	2.7 %	56.1 %
Neuropsychiatric diagnoses	6	2.7 %	58.8 %
Neuropsychiatric problems	5	2.3 %	61.1 %
Neuropsychiatric impairment	5	2.3 %	63.4 %
Neuroleptics	4	1.8 %	65.2 %
Depression	3	1.4 %	66.6 %
Neuropsychiatric disabilities	3	1.4 %	67 %
Autism-like	3	1.4 %	68.4 %
Bipolar disorder	3	1.4 %	69.8 %
Antisocial personality disorder	3	1.4 %	71.2 %
Psychotic breakthrough	3	1.4 %	72.6 %
Developmental disorder	2	0.9 %	73.5 %
Psychotic problem	2	0.9 %	74.4 %
Serious mental disorder	2	0.9 %	75.3 %
Mild mental retardation	2	0.9 %	76.2 %
Anxiety	2	0.9 %	77.1 %
Tourette's syndrome	2	0.9 %	78 %
Mental disorder	2	0.9 %	78.9 %
Mild developmental disability	2	0.9 %	79.8 %
Mild intellectual disability	2	0.9 %	80.7 %

Frequencies of *Focus Word*

Levels*	Counts**	% of Total	Cumulative %
Combined ADHD	2	0.9 %	81.6 %
Narcissistic personality disorder	2	0.9 %	82.5 %
Brain fatigue	1	0.5 %	83 %
Developmental disability	1	0.5 %	83.5 %
DTD	1	0.5 %	84 %
Attachment disorder	1	0.5 %	84.5 %
Psychotic syndrome	1	0.5 %	85 %
Neurological disabilities	1	0.5 %	85.5 %
Neuropsychiatric symptoms	1	0.5 %	86 %
Adjustment difficulties	1	0.5 %	86.5 %
Generalized social phobia	1	0.5 %	87 %
Autism spectrum	1	0.5 %	87.5 %
Neuropsychiatric functional variation	1	0.5 %	88 %
Atypical autism	1	0.5 %	88.5 %
Cognitive ability	1	0.5 %	89 %
PTSD	1	0.5 %	89.5 %
Diffuse neuropsychiatric disorder syndrome	1	0.5 %	90 %
Moderate conduct disorder	1	0.5 %	90.5 %
Mental retardation	1	0.5 %	91 %
ADHD-like	1	0.5 %	91.5 %
Paranoid schizophrenia	1	0.5 %	92 %
Neuropsychological problem	1	0.5 %	92.5 %
High-functioning autism	1	0.5 %	93 %
Wernicke's encephalopathy	1	0.5 %	93.5 %
Complex personality disorder	1	0.5 %	94 %
Neurological disability	1	0.5 %	94.5 %
Emotionally unstable personality disorder	1	0.5 %	95 %
Cognitive impairment	1	0.5 %	95.5 %
Bulimia	1	0.5 %	96 %
Autism spectrum disorder	1	0.5 %	96.5 %
Epilepsy	1	0.5 %	97 %
Defiance syndrome	1	0.5 %	97.5 %
Composite personality disorder	1	0.5 %	98 %
Borderline	1	0.5 %	98.5 %

Frequencies of *Focus Word*

Levels*	Counts**	% of Total	Cumulative %
Tics	1	0.5 %	99 %
OCD	1	0.5 %	99.5 %
Neuropsychiatric disorders	1	0.5 %	100 %
Parkinson's disease	1	0.5 %	100.5 %
Dementia	1	0.5 %	101 %

** Asperger's syndrome and Neuropsychiatric disability qualify as belonging to medium frequency at > 5%, whereas ADHD qualify as high frequency at > 15%*
*** Each count corresponds to roughly 0.452*
*** N = 221*

Frequencies of *Focus Word*

Focus Word*	Adherence**				
	0	1	2	3	4
ADHD	**1**	**0**	**7**	**16**	**37**
Neuropsychiatric disability	**0**	**1**	**1**	**5**	**7**
Asperger's syndrome	**1**	**0**	**1**	**1**	**10**
Neuropsychiatric diagnosis	0	0	2	3	4
Mental illness	0	0	1	4	3
Neuropsychiatric problem	0	0	1	3	3
ADD	2	0	1	0	3
Autism	0	0	1	2	3
Neuropsychiatric diagnoses	0	0	0	1	5
Neuropsychiatric problems	1	0	0	2	2
Neuropsychiatric impairment	0	0	1	1	3
Neuroleptics	0	0	0	0	4
Depression	0	0	0	0	3
Neuropsychiatric disabilities	0	0	1	1	1
Autism-like	1	0	0	0	2
Bipolar disorder	0	0	0	0	3
Antisocial personality disorder	0	0	1	0	2
Psychotic breakthrough	0	0	0	0	3
Developmental disorder	1	0	0	0	1
Psychotic problem	1	0	0	0	1
Serious mental disorder	0	0	0	0	2
Mild mental retardation	0	0	1	0	1
Anxiety	0	0	0	0	2
Tourette's syndrome	0	0	0	0	2
Mental disorder	0	0	0	0	2
Mild developmental disability	0	0	0	0	2
Mild intellectual disability	0	0	0	1	1

Frequencies of *Focus Word*

Focus Word*	Adherence**				
	0	1	2	3	4
Combined ADHD	0	0	0	1	1
Narcissistic personality disorder	0	0	0	2	0
Brain fatigue	0	0	0	0	1
Developmental disability	0	0	0	0	1
DTD	0	0	0	0	1
Attachment disorder	0	0	0	0	1
Psychotic syndrome	0	0	0	0	1
Neurological disabilities	0	0	0	0	1
Neuropsychiatric symptoms	0	0	0	0	1
Adjustment difficulties	0	0	0	0	1
Generalized social phobia	0	0	0	0	1
Autism spectrum	0	0	0	0	1
Neuropsychiatric functional variation	0	0	1	0	0
Atypical autism	0	0	0	0	1
Cognitive ability	0	0	0	1	0
PTSD	0	0	0	0	1
Diffuse neuropsychiatric disorder syndrome	0	0	0	0	1
Moderate conduct disorder	0	0	0	0	1
Mental retardation	0	0	1	0	0
ADHD-like	0	0	0	0	1
Paranoid schizophrenia	0	0	0	0	1
Neuropsychological problem	0	0	0	1	0
High-functioning autism	0	0	0	0	1
Wernicke's encephalopathy	0	0	0	1	0
Complex personality disorder	0	0	0	0	1
Neurological disability	0	0	0	0	1
Emotionally unstable personality disorder	0	0	0	1	0
Cognitive impairment	0	0	0	0	1
Bulimia	0	0	0	0	1
Autism spectrum disorder	0	0	0	0	1
Epilepsy	0	0	0	1	0
Defiance syndrome	0	0	0	0	1

Frequencies of *Focus Word*

	Adherence**				
Focus Word*	**0**	**1**	**2**	**3**	**4**
Composite personality disorder	0	0	0	0	1
Borderline	0	0	0	0	1
Tics	0	0	0	1	0
OCD	0	0	0	1	0
Neuropsychiatric disorders	0	0	0	0	1
Parkinson's disease	0	0	0	0	1
Dementia	0	0	0	0	1

** Focus Word shows the frequency by which a specific neuromedical term has been used, and the frequency with which it was adhered to*
*** Adherence ordered in accordance with percentual counts*

Frequencies of *Focus Word*

Focus Word*	Complexity**				
	1	2	3	4	5
Neuropsychiatric diagnosis	0	0	0	2	7
Neuropsychiatric problem	0	0	0	0	7
Mental illness	0	0	2	0	6
Neuropsychiatric problems	0	0	0	0	5
Neuropsychiatric diagnoses	0	0	0	2	4
Autism	0	0	0	2	4
Neuropsychiatric impairment	0	0	0	1	4
Neuroleptics	0	0	0	0	4
Neuropsychiatric disability	**0**	**1**	**2**	**8**	**3**
ADD	0	0	0	3	3
Bipolar disorder	0	0	0	0	3
Antisocial personality disorder	0	0	0	0	3
Psychotic breakthrough	0	0	0	0	3
Neuropsychiatric disabilities	0	0	0	1	2
Depression	0	0	0	1	2
Tourette's syndrome	0	0	0	0	2
Psychotic problem	0	0	0	0	2
Mild mental retardation	0	0	0	0	2
Mild intellectual disability	0	0	0	0	2
Developmental disorder	0	0	0	1	1
Anxiety	0	0	0	1	1
Combined ADHD	0	0	0	1	1
Narcissistic personality disorder	0	0	0	1	1
Autism-like	0	0	2	0	1
Mental disorder	0	0	1	0	1
Serious mental disorder	0	0	1	0	1
Mild developmental disability	0	0	1	0	1

Frequencies of *Focus Word*

Focus Word*	Complexity**				
	1	2	3	4	5
Developmental disability	0	0	0	0	1
DTD	0	0	0	0	1
Attachment disorder	0	0	0	0	1
Psychotic syndrome	0	0	0	0	1
Neurological disabilities	0	0	0	0	1
Neuropsychiatric symptoms	0	0	0	0	1
Adjustment difficulties	0	0	0	0	1
Generalized social phobia	0	0	0	0	1
Autism spectrum	0	0	0	0	1
Atypical autism	0	0	0	0	1
Cognitive ability	0	0	0	0	1
Moderate conduct disorder	0	0	0	0	1
Paranoid schizophrenia	0	0	0	0	1
Neuropsychological problem	0	0	0	0	1
High-functioning autism	0	0	0	0	1
Emotionally unstable personality disorder	0	0	0	0	1
Cognitive impairment	0	0	0	0	1
Bulimia	0	0	0	0	1
Autism spectrum disorder	0	0	0	0	1
Defiance syndrome	0	0	0	0	1
Composite personality disorder	0	0	0	0	1
Borderline	0	0	0	0	1
Tics	0	0	0	0	1
Neuropsychiatric disorders	0	0	0	0	1
Asperger's syndrome	**0**	**0**	**2**	**11**	**0**
Brain fatigue	0	0	0	1	0
Neuropsychiatric functional variation	0	0	0	1	0
Complex personality disorder	0	0	0	1	0
Neurological disability	0	0	0	1	0
Parkinson's disease	0	0	0	1	0
Dementia	0	0	0	1	0
OCD	0	0	0	1	0

Frequencies of *Focus Word*

Focus Word*	Complexity**				
	1	2	3	4	5
ADHD	**4**	**7**	**50**	**0**	**0**
PTSD	0	0	1	0	0
Diffuse neuropsychiatric disorder syndrome	0	0	1	0	0
Mental retardation	0	0	1	0	0
ADHD-like	0	0	1	0	0
Wernicke's encephalopathy	0	0	1	0	0
Epilepsy	0	0	1	0	0

** Focus Word shows which neuromedical terminology is commonly associated with which level complexity*

*** Complexity ordered in accordance with highest order of complexity to lowest*

APPENDIX: *Prevalence data*

ID	Personalia	Psych*	Neuro*
Göteborg	59922	5958	284
Södertörn	52312	4780	231
Stockholm	39477	3363	130
Malmö	25290	2681	77
Solna	20840	2381	91
Attunda	20170	2150	113
Uppsala	18840	2166	97
Örebro	18111	2214	81
Värmland	18017	1968	80
Lund	16653	2120	65
Helsingborg	16566	1974	58
Västmanland	14571	1726	35
Linköping	11951	1426	67
Kalmar	11892	1966	73
Skaraborg	11699	1250	54
Södertälje	10359	933	31
Luleå	9948	1153	74
Borås	9939	1681	67
Jönköping	9826	1106	67
Nyköping	9650	1104	42
Norrköping	9336	1204	55
Falun	9103	1557	49
Ystad	8745	893	22
Sundsvall	8634	700	31
Varberg	8393	1407	56
Östersund	8316	870	43
Eskilstuna	8223	762	22
Växjö	8073	934	38
Uddevalla	7614	970	41
Nacka	7495	799	46
Ångermanland	7362	706	22
Kristianstad	7265	601	17
Umeå	7257	993	34
Hudiksvall	7144	917	54
Blekinge	7016	727	20
Halmstad	6898	1171	51
Alingsås	6848	930	50
Vänersborg	6656	984	34
Gävle	6229	1020	39
Eksjö	5694	663	35
Gotland	4208	440	32
Norrtälje	4042	512	36
Skellefteå	3728	539	27

Hässleholm	3608	366	15
Gällivare	2830	311	18
Haparanda	2613	232	11
Mora	2600	420	20
Lycksele	1436	188	6
Total:	583399	65916	2741