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REVIEW ARTICLE

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Medical genetics in the 19th century as background to the development of psychiatric genetics

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Abstract

This article examines the relationship between the early efforts of alienists to understand the role of heredity in the etiology of insanity in the 19th century and the parallel efforts of the nascent discipline of medical genetics. I review three monographs on general medical genetics: Adams in 1814, Steinau in 1843, and Lithgow in 1889. Numerous parallels were seen between their writings and those of their contemporary alienists working on mental disorders including (i) an emphasis on the transmission of the liability to illness rather than the illness itself, (ii) discussions of the homogeneous versus heterogeneous nature of familial transmission of disease, (iii) the relative value of direct versus indirect hereditary effects, (iv) the role of mothers versus fathers in transmitting liability, (v) possible environmental sources of familial clustering, and (vi) the transmission of age at onset of illness. All three medical genetic authors noted that insanity was among the more heritable of human disorders. Furthermore, Lithgow noted the importance of heritable influences on the non-psychotic forms of psychiatric illness rarely seen in asylums. This survey demonstrates substantial consilience in the topics of interest and conclusions of the nascent general medical and psychiatric genetics' communities in the 19th century.

In trying to understand the origins of Psychiatric Genetics in the 19th century, the modern reader, typically conversant with the current field in the early 21st century, is faced with a dilemma. If she encounters some oddity of theory or method in the work with which she is unfamiliar, is it because early studies of psychiatric genetics deviated from the common practice or was that just how medical genetics was done in the 1800s? It is a lot to expect current psychiatric geneticists who might be interested in the history of their discipline to also review carefully the general medical genetics in the 19th century so can they judge for themselves, or to study the modest number of secondary sources available, in particular, a pair of volumes by Rushton (1994, 2009) and a thesis by Lopez-Beltran (1992). Most histories of medical genetics pay minimal to no attention to work performed before Mendel (e.g., Harper, 2019; Sturtevant, 2001).

My primary motivation, therefore, for writing this article is to fill that gap—to provide, for those interested in the history of psychiatric genetics, a succinct background in the medical genetics of the 19th century and thereby to provide the needed historical context. Psychiatry in the 19th century was largely an asylum-based occupation. Most practitioners of psychiatric genetics in this period were alienists—living their professional lives in rural areas where most asylums were placed. They were typically divorced from their medical peers especially the specialists who typically concentrated in urban areas, such as London, Paris, and Berlin.

I have two subsidiary aims for this article. The first is to inquire what the generalist medical geneticists of the 19th century thought about psychiatric illness. Was this a "main-stream" topic for them, or was it of little or no importance? If mentioned, did they concur with most of the specialist alienist literature that concluded that mental illness was indeed substantially hereditary (Kendler, 2021c)? Second, the vast proportion of psychiatric genetic studies in the 19th century was done by alienists in asylum setting, nearly always on some form of severe mental illness, most typically generic madness or insanity. Might these more general medical genetics texts give us a glimpse of what was known or thought about the role of hereditary factors in

those forms of mental illness rarely seen in asylums such as hysteria, hypochondria, or alcoholism?

Since an encyclopedic review was out of the question, I focused on three general monographs on what today we would call medical genetics, distributed across the 19th century, all from the United Kingdom: Adams published in 1814 (Adams, 1814), Steinau in 1843 (Steinau, 1843), and Lithgow in 1889 (Lithgow, 1889). These were chosen from a detailed general review of this period: (Rushton, 2009). These reviews were chosen using the following criteria: (i) none of the authors were alienists or worked extensively with the mentally ill, (ii) one chosen each for the early, middle, and later parts of the 19th century, and (iii) each providing sufficient detail about the methodology and/or theory of medical genetics to be review-worthy. I review each volume in chronological order. Then, I compare the themes they raised to those I previously reviewed in the psychiatric genetics literature across this same time period (Kendler, 2021c) and comment on the degree to which I have been able to address the two subsidiary aims noted above.

1 | ADAMS (1814)

On the title page of his 1814 book "A Treatise on the Supposed Hereditary Properties of Diseases", Joseph Adams (1756–1818) is described as "Licentiate of the London College of Physicians, Honorary Secretary to the Medical Society of London, Physician of the Hospitals for Small-Pox, Inoculation, and Vaccination."(Adams, 1814) He was described as "A Forgotten Founder of Medical Genetics" by the eminent American 20th-century geneticist Arno Motulsky (Motulsky, 1959). His book consisted of only 41 small pages of principles, followed by commentary and documentation. Adams sought to establish principles of hereditary diseases in man and did not attempt, as did Steinau and Lithgow, to review the field more generally.

He makes a series of distinctions of forms of familial transmission of diseases, beginning by noting the importance of

> … the necessary distinction between a family and an hereditary peculiarity of constitution; and, secondly, in marking the period of life and other circumstances under which such peculiarities, whether family or hereditary, show themselves. The distinction between a family and hereditary peculiarity consists in this; that the first is confined to a single generation, to brothers and sisters, the children of the same parents; and the second is traced from generation to generation (Adams, 1814, p. 12).

Adams distinguished between disorders concentrated within sibships without cross-generational transmission versus those transmitted from parents to children. He then discussed differences as a function of age at onset.

> Diseases either appear at birth, in which case they are called congenital or connate; or they arise afterward. The first only can with propriety be called hereditary…, all others we should consider as hereditary or family susceptibilities to certain diseases (Adams, 1814, p. 13).

So, for Adams, If the disease appears at birth, as might occur for a physical anomaly, then it can be truly called "hereditary"—meaning that the disease itself is inherited. If the disease appears later in life, then a susceptibility is inherited, not the disorder itself.

Adams next makes a finer distinction between a disposition and a predisposition to disease:

> But if the susceptibility, though greater than is remarked in other families, is so far less than a disposition as always to require the operation of some external cause to induce the disease; this minor susceptibility may be called a predisposition to the disease (Adams, 1814, p. 14).

So Adams divides hereditary disorders into three kinds of the basis of what we might say in modern parlance was a combination of age at onset and penetrance. *Connate* disorders always appear at birth. Disorders transmitted as a *disposition* always appear but later in life. Those, however, where only a *predisposition* is inherited require some other, presumably environmental risk factors, to manifest itself.

Adams then wants to illustrate these principles with two examples:

> Gout and madness are, by almost universal consent, considered hereditary; yet, if we admit the general implication as to their immediate causes, both these diseases, and particularly the former, should be considered as only hereditary in predisposition …. in most cases … the habits of the sedentary and wealthy are necessary to induce the gouty action …. [in such cases] … it is only hereditary in predisposition; but in some, the susceptibility to gout is so strong as to require no other stimuli for inducing the action …. In gout, therefore, we must admit the two degrees of susceptibility, disposition, and predisposition …. In madness, the difficulty may seem greater, but this is only on account of the frequent impossibility of ascertaining the state of mind previous to such a change, and still more from the ill-judged secrecy with which such events are often obscured (Adams, 1814, p. 17).

So, susceptibility to gout can come, according to Adams, in two forms. If as a predisposition, environmental risk factors (e.g., "the habits of the sedentary and wealthy) are also needed to produce an onset of illness. If as a disposition, the disorder will develop on its own. It is never connate as infants are not, we can assume, ever born suffering from gout. For madness, it is even harder to specify its specific form of inheritance. But it is, for our purposes, noteworthy that of all the diseases to examine as examples of hereditary transmission by Adams, one of the two was madness.

Adams tells the reader why these distinctions could be practical import:

> The above illustrations are sufficient to shew, that when the susceptibility to a hereditary or family disease is so great as to amount to a disposition, that is, so great, that the disease is induced without any external causes, we can have little hopes of preventing it (Adams, 1814, p. 21).

I close our brief review of this important document with the final thoughtful comments Adams makes about the nature of the inheritance of madness and the clinical implications thereof.

> Madness, as well as gout, is never hereditary, but in susceptibility; and those who have paid the greatest attention to the subject, must admit the two degrees of susceptibility. When we perceive … several children of the same parents … seized with madness about the age of puberty, we cannot but admit a disposition to the disease; for though some mental irritation is usually assigned, yet the cause is often so trivial, that we cannot doubt whether the supposed effect has preceded it …. Sometimes we find the disease cease, as the changes of the constitution during that period are completed. If that should not be the case, little can be expected from art [medical care]. But when the susceptibility amounts only to a predisposition, requiring the operation of some external cause to produce the disease, there is every reason to hope, that the action of the disease may be for the most part much lessened, if not prevented altogether(Adams, 1814, pp. 26–27).

Thus, Adams concludes that, like gout, madness can be inherited either as a disposition or a predisposition.

2 | STEINAU (1843)

Steinau was a German physician with a position at the Royal Medical College in Berlin who emigrated to England after his medical training. He writes in his Preface to "Pathological and Philosophical Essay on Hereditary Diseases."

> The highly important and interesting doctrine of the Inheritance of Diseases, with regard to Pathology and Philosophy, as well as in other manifold relations, invited and riveted my attention and meditation, at my first entering into the study of Medicine (Steinau, 1843, p. i).

He wrote an early version of his article in German prior to his emigration that he then expanded upon in his English version. Ruston considers this article one of the four prominent overall surveys of the field published in England in the 19th century (Rushton, 2009). He articulated the goals of his article as follows:

> I endeavored to consider, systematically, and in succession, the main points on which depend the examination of this important theme; to collect the opinions and experience of the most celebrated Practitioners; and to compare the same with my own notion and practice (Steinau, 1843, p. i).

We are most interested in his section entitled "Of Hereditary Diseases Generally" which he begins as follows:

> … as children generally resemble their parents in outward form, in figure, features, voice, color of the hair and eyes, &c, also in their mental capacities and dispositions, in temper, inclinations, and their moral character generally—and as they inherit the virtues and vices of their parents, modified only by education, [and] instruction …—so they inherit, in most cases also, the diseases of their parents: and consequently there exist diseases which themselves, as well as the disposition thereto, are transferred from the parents to their children … (Steinau, 1843, p. 1).

Steinau includes the resemblance of both the physical and mental attributes of parents and children as obvious evidence for heredity and distinguishes between children inherited the diseases "as well as the disposition thereto," adopting the same distinction articulated by Adams.

We now briefly review the relevant aspects of Steinau's theory of inheritance. In trying to define what he means by "hereditary," he, along with Adams, makes the point that not all familial disorders need be hereditary:

> It cannot be denied that many diseases have been considered hereditary which were by no means such, but which were only caused by detrimental influences, to which the parents and their children were equally exposed (Steinau, 1843, pp. 3–4).

In this line of thought, Steinau then makes the distinction between hereditary and innate diseases, which differs somewhat from the views of Adams:

> If a disease be communicated by parents to their children before their birth, and by these again to their offspring, and so on, such a disease is called a hereditary disease; and must be distinguished from those which are called innate… [which are] those with which neither of the parents was affected, but were acquired by the fetus during its stay in the uterus… (Steinau, 1843, p. 5).

Steinau thus notes that congenital disorders need not be hereditary. He makes a further distinction between hereditary and "family" diseases, the latter defined along the lines articulated by Adams. He suggests a possible environmental origin for at least some familial disorders which can result from "… a bad regimen … to which the children were subjected in their earliest infancy, and are thus caused by noxious influences to which they were all equally exposed (Steinau, 1843, pp. 7–8)."

But Steinau also believes in the inheritance of acquired characteristics. He notes that family diseases "… can certainly be communicated by the individuals affected with them to their progeny, in which case they are changed into hereditary diseases (Steinau, 1843, p. 8)." In a fascinating footnote, Steinau considers whether hereditary diseases should include those where the diseases are acquired "by the milk of their mother or nurse (Steinau, 1843, p. 9)," but rejects the proposition.

Steinau then turns to reviewing the nature of what, in hereditary diseases, is exactly transmitted across generations, noting a controversy "as to whether it is merely the disposition to a disease, or the disease itself, which is hereditary (Steinau, 1843, p. 9)." His views largely echo those of Adams, noting the claim that the disease itself is transmitted is most appropriate when the traits/disorders "are brought into the world with the children (Steinau, 1843, p. 11)." This occurs, he notes with physical deformities, supernumerary fingers, or cataracts. He then writes that for "…other diseases, especially of many so-called internal diseases, the mere disposition only is more frequently inherited …(Steinau, 1843, p. 11)."

If only the disposition is inherited, Steinau then examined what influences the age of onset of disorder?

> In cases where the disposition only has been transferred … still it frequently develops itself into perfect disease only at that very period of life in which the parents, from whom the disposition was inherited, were affected by it (Steinau, 1843, p. 11).

In our terminology, he suggests that not only disease risk, but age-at-onset of diseases are also hereditary. He gives the following interesting example: "Thus the disposition to phthisis develops itself in youth; that to hypochondria or gout in manhood … (Steinau, 1843, p. 11)." Of his three proposed heritable disorders, one is infectious, one psychiatric and one metabolic.

> Other evidence for the transmission of the disposition to disease can be seen in pedigrees when the disease is present in a grandparent and only shews itself again in the grandchild; the father or mother having inherited the disposition in only a slight degree, which remained latent with them, and did not ripen into disease, not having been excited by additional causes (Steinau, 1843, p. 12).

Steinau continues in describing what might be necessary for a hereditary disposition to result in an illness:

> Another point, about which authors differ in their opinions, is, whether accessory causes, namely, external noxious influences, are always required to make the inherited disposition pass into disease. Some maintain that these are always necessary: others say, that, notwithstanding the greatest precaution taken in keeping off all external influences, the hereditary disposition cannot be prevented from passing, at the proper period, into real disease (Steinau, 1843, p. 12).

Steinau adopts the former position, rejecting the distinction raised by Adams between a disposition and a predisposition to illness. He continues, "it is clearly proved by the greatest pathologists that no disposition, however strong it may be, can pass into real disease without the existence of accessory causes (Steinau, 1843, p. 12)." Steinau here describes what is among the most popular broad medical theories in the 19th century that was consistently applied to insanity, and divides etiologic factors into those that are predisposing versus exciting, with heredity features being among the most common predisposing factors (Kendler, 2020).

Steinau's next section examines.

> …whether those diseases under which parents labored long before or long after the birth of their children are to be considered as hereditary, when we have reason to apprehend that their children have inherited the disposition to them (Steinau, 1843, p. 13).

He answers this positively, stating that he has "no difficulty in assuming that the disposition has been communicated to the children in those cases where parents are attacked by a disease after the birth of the latter (Steinau, 1843, p. 13)." He notes that if you believe that a disposition can pass from an affected grandparent through an unaffected parent to an affected child, how could it not be possible that a yet unaffected parents would transmit that disposition to a child? He expressed this somewhat poetically, "From experience, we know that children may become sooner or later the unfortunate heirs of all diseases under which their parents have labored, at any period of their life (Steinau, 1843, pp. 13–14)."

Before he goes on to comment about specific hereditary diseases, he addresses two other questions we summarize briefly. The first is whether children inherit more frequently the diseases of their fathers or mothers? Steinau notes strong opinions on both sides and concludes that "neither of these opinions seem to be warranted by experience (Steinau, 1843, p. 18)." The second is whether diseased parents must have diseased children. He responds emphatically, "According to all experience, this question must, decidedly, be answered in the negative (Steinau, 1843, p. 19)."

In his second main section, Steinau examines those diseases which have been widely considered to be hereditary. His list is quite varied: bodily deformities, morbid affections of the teeth and hair, ruptures, phthisis, epilepsy, "mental diseases," dropsy, hemorrhoids, gout, lithiasis, and apoplexy. His comment on mental diseases is worthy of quotation.

> In conjunction with epilepsy, we may mention mental diseases, all of which must, in all their different forms, be classed among those which most frequently occur hereditarily… a person does not so easily become deranged in his mind: there is always a peculiar disposition necessary to it; and, unfortunately, this disposition is in most cases inherited (Steinau, 1843, p. 33).

3 | LITHGOW (1889)

Robert Alexander Douglas Lithgow (1846–1917), a British Obstetrician, published the 247-page book "Heredity: A Study With Special Reference to Disease," which he described as "the first systematic effort to trace the influence of Heredity in all the main diseases which afflict humanity… (Lithgow, 1889, p. i)" in 1889. Of note, Darwin's origin of species was published in between the publication of Steinau's and Lithgow's monographs, and Lithgow refers to Darwin and his theory relatively frequently. However, no reference is given to the work of Galton, especially his 1869 book "Hereditary Genius: An Inquiry Into Its Laws and Consequences." Lithgow describes that his goal for this volume was

> … to view heredity in its physiological, psychological, and pathological aspects, and in the space at my disposal to give at least some general idea of this most important biological law (Lithgow, 1889, p. 7).

He is optimistic about his level of knowledge about the operation of heredity which he understands as being entirely within the realm of physiology:

> I have stated that heredity is a physiological law; but it is a law within a law, being in a sense the effect of generation. The phenomena of inheritance have not only been observed, but the conditions realized; and the analysis of these has indicated where we must seek for the laws of which heredity is the manifestation … (Lithgow, 1889, p. 10).

He adds that "All the elements and functions of the human body are subject to heredity internal as well as external its peculiarities, diseases, and even acquired modifications." Indeed the support for the inheritance of acquired characteristics did not diminish until the waning years of the 19th century after Weissmann showed that, in multicellular organisms, inheritance only takes place only via the germ cells (Robinson, 1979).

While stressing the ubiquity of inheritance, Lithgow also is clear about its limitations as transmission is never complete: "It must, however, be remembered that an exact likeness (either physical, mental, or moral), is never transmitted by inheritance (Lithgow, 1889, p. 18)." There is "always a principle of variation" at work in heredity, a doctrine prominently first articulated by Prosper Lucas (Lucas, 1847) but then becoming, as Lithgow points out, a primary feature of Darwin's theory of evolution (Darwin, 1859).

Lithgow then articulates his "laws of heredity" of which he lists five but quickly dismisses one so we will focus on the remaining four: "I—Direct Heredity, II—Reversional Heredity, or Atavism, III—Collateral, or Indirect Heredity, and IV—Specialized or Initial Heredity (Lithgow, 1889, p. 24)."

He defined law # 1 as follows:

> Direct Heredity consists in the transmission of paternal and maternal qualities to the children. This form presents two aspects: I. A child may resemble both its parents equally, as regards both physical and moral characters… II. A child, while resembling both parents, may resemble one of them peculiarly (Lithgow, 1889, p. 25).

He then discussed at some length the varieties of selective parent-offspring transmission including when it is within sex (i.e., mother to daughter…; "direct") or across sexes (i.e., mother to son…; "diagonal").

He then describes law # 2:

> Reversional Heredity, or Atavism occurs when a child resembles its grandparents or earlier ancestors and is a very influential law. The grandson very frequently resembles his grandfather, and the granddaughter her grandmother (Lithgow, 1889, p. 27).

He here makes one of his first references to the inheritance of mental illness:

> Reversional heredity is often manifested in insanity. Thus, an insane father may have clever and distinguished sons, probably geniuses, yet the offspring of these may manifest insanity at any time, even suddenly (Lithgow, 1889, p. 27).

The tendency of genius to cluster in the close relatives of the insane was not a rare observation in the 19th century. Later, Lithgow describes the likely basis of this law echoing positions taken by Adams and Steinau:

> With regard to cases of reversional heredity, when the grandson resembles the grandfather … the intermediate stages being totally unlike either, the phenomena may be explained by the fact that these resemblances have been preserved in the latent state by the intermediate generations …. The law of heredity is in latent, albeit not in patent, action. This latency or dormancy of ancestral qualities … afterward wakes again to open activity … (Lithgow, 1889, p. 29)

Lithgow then articulates his third law:

> Indirect Heredity is … only a modification of atavism, differing from it only in appearance. It occurs when a child resembles in its physical, mental, and moral character, an uncle or aunt, or some other relative out of the direct line of descent (Lithgow, 1889, p. 27).

His fourth law, the most unusual from a modern perspective, is described as

> Specialized, or Initial Heredity … is a form of heredity of considerable importance …. It depends upon the temporary mood or condition, good or bad, fortunate or unfortunate, of parents when they became such (Lithgow, 1889, p. 28).

This is a special example of inheritance of acquired characteristics where the state of mind of parents at the time of procreation can have a substantial effect, for good or bad, on their offspring then conceived. Lithgow then takes up the question of the homogeneity versus heterogeneity of hereditary transmission, using neuropsychiatric disorders as examples:

> I must now consider … those very interesting phenomena denominated metamorphoses or transformations in transmission, which occur … between generation and generation … we may regard these metamorphoses in transmission not so much as exceptions to the law of heredity … as differences in kind as differences in degree, characterizing certain individuals in consequence of the law of variability …. I may state that nervous affections are often so transformed (Lithgow, 1889, pp. 123–124).

Lithgow gives his theory about the origins of such transformations which contains some echoes of Darwin's theory of evolution:

> I contend that these metamorphoses are simply the natural phenomena of the law of variability to which every individual is subject, and which is the fundamental element in his individuality …. for Nature preserves the type or species not by simply reproducing the parents in the children in a monotonous succession, but by varying each individual within certain limits (Lithgow, 1889, p. 126).

Lithgow returns to the range of mental phenomena which is under the sway of heredity:

> But to return to the consideration of heredity in connection with nervous diseases. It must be conceded that heredity predisposes mankind not only to such diseases as epilepsy and insanity, but to peculiarities in the mode in which man is affected by minor ailments. For example, how frequently do we recognize a predisposition to cephalalgia [headaches] in those families whose inheritance seems to have especially influenced the nervous system; also to dyspeptic troubles … abnormal moral habits, which, when they have fixed themselves in the cerebral organism, tend to reproduce themselves in succeeding generations, as we see in hereditary kleptomania (Lithgow, 1889, pp. 128–129).

So the spectrum of hereditary influences on insanity includes what we might now consider psychosomatic and "neurotic" disorders such as headaches and kleptomania. Lithgow even comments on the concept of the *neuropathic personality*, claiming that there is:

> now [a] well-established neuropathic predisposition, which may be either inherited or acquired, and which is a factor of prime importance in the etiology of such neuroses as the psychoses, chorea, epilepsy, hysteria, hypochondriasis, etc. By this term, we understand a pathological constitution affecting the functional activity of the nervous system, in consequence of which those subject to its influence exhibit throughout their lives the utmost variety of symptoms in connection with pathological processes, whether sensory, motor, or psychical (Lithgow, 1889, pp. 129–130).

He then describes two particular forms of such disorders: hysteria and alcoholism:

> Among those nervous diseases, a predisposition to which is undoubtedly inherited, I shall instance, in the first place, hysteria. So important is this predisposition as a cause of hysteria that it is capable of developing not only a tendency or liability to it, but also the complete evolution of the disease itself (Lithgow, 1889, pp. 131–132).

In this connection, I may now briefly refer to alcoholism; the pernicious effects of alcoholic excesses on the nervous system being well known, and these are, according to all competent observers, markedly hereditary in many cases. In cases of inherited predisposition to chronic habitual drinking … the family is characterized by that form of unstable nervous organization which I have already alluded to as a neuropathic predisposition, and that the neurotic taint which manifests itself in other members in such affections as hysteria, epilepsy, and insanity will be manifested in these cases by an intense, if not insuperable, craving for alcohol (Lithgow, 1889, p. 138).

Quite late in his book, Lithgow turns to the consideration of the role of predisposition in hereditary diseases:

> In considering what is meant by predisposition, I discussed it [as] a peculiar state of the physical and mental constitution of every individual, mainly hereditary,

> which renders him specially liable to suffer injuriously from the effects of certain morbific agents, and when these latter are of a nonspecific type, predisposition will determine the particular disease which it shall induce in each of several individuals similarly exposed to it (Lithgow, 1889, p. 236).

He continues

> … just as every individual differs from every other physiologically and psychologically, so he differs from every other in his predisposition to disease, and all these differences are the result of heredity and variability. Predisposition is, in fact, a tendency, mainly hereditary, in the tissues or organs of the body to readily assume certain morbid processes, in the presence of certain exciting causes, and may thus be regarded as *the result of a minor degree of heredity* to that in which certain morbid conditions are actually transmitted (Lithgow, 1889, p. 236).

4 | DISCUSSION

My goal in this article was to provide an overview of the themes considered in the nascent field of medical genetics in the 19th century as a backdrop to an understanding of the early works in psychiatric genetics from that same era. I sought to address three specific themes, which I now consider in order.

First, to what extent were the concerns of proto-medical geneticists of the 19th century similar to or divergent from the writings of the alienists of the century about the role of heredity in insanity? Our 19th-century medical geneticists were very interested in the nature of the familial transmission of biomedical conditions and especially the differences between the transmission of a disorder versus the susceptibility to that disorder. For most conditions, they concluded that susceptibility to disease was what children inherited from their parents. We saw some disagreement among our medical genetics authors in the ways they conceptualized that. Adams gave names to two levels of diseases liability: disposition and predisposition. Neither Steinau nor Lithgow adopted that particular terminology, but all three clearly agreed on the general concept—that disease most typically arose when individuals at genetic risk experienced some kind of exciting cause, typically from the environment. The interest in the nature of hereditary transmission was also prominent in many of those writing on psychiatric genetics in this century, from authors as diverse as Spurzheim, Nobel, Morel, and Kraepelin (Kendler, 2021c). As in medical diseases, they favored the hypothesis of a transmitted liability in part because of the common observation that insanity often skip generations or affects only one among a number of siblings (Kendler, 2021c).

A major theme for psychiatric geneticists of the 19th century was whether the nature of the transmission of mental illness within families was homogeneous ("like transmitting like") or heterogenous—that is relatives of insane patients suffering from a wide range of psychiatric disorders. The majority of alienist authors argue that heterogeneous transmission was by far the more common finding (Kendler, 2021c). In our small sample of medical genetic authors, only Lithgow discusses this topic in detail, emphasizing the frequency of heterogeneous transmission of illnesses, framing it as a metamorphosis of disorders in the process of familial transmission. He considers it common in hereditary diseases and the result of the underlying process of individual variability. It is of special interest that this surgeon notes that "nervous affections" are particularly often transformed as they pass through families.

Those working in the genetics of psychiatric illness in the 19th and early 20th century debated whether the sole focus should be on parent-offspring transmission (i.e., direct heredity) or whether collateral relatives (i.e., indirect heredity) should also be considered, especially when deciding whether an admitted asylum patient did or did not have a "hereditary load." (Kendler & Klee, 2021). We see the same discussion occurring in our medical genetic authors.

Concerned with distinguishing different sources of familial aggregation, our medical authors considered factors other than inheritance, separating out disorders they considered familial but not hereditary. It was Steinau who particularly pointed out that such familial disorders could arise from environmental effects ("… caused by detrimental influences, to which the parents and their children were equally exposed; Steinau, 1843, pp. 3–4)". Similar points were raised by a 19th-century psychiatric authors, suggesting that some of the transmission of insanity within families could arise from shared environmental exposures (Dahl, 1859; Kendler, 2021c).

Steinau also raised the hypothesis that age at onset for many medical diseases appears to be inherited. This had also been claimed for various psychiatric disorders, first by the early 19th-century alienist Haslam (Haslam, 1798; Kendler, 2021c) and is repeated by Steinau for hypochondriasis. Our medical authors also expressed interest in the broad question of whether disease risk was more often transmitted to offspring through the father or the mother. This too was a common topic for 19th-century psychiatric genetic investigators (Kendler, 2021a).

This admittedly incomplete survey demonstrates substantial consilience between the topics of interest to the general medical and to the psychiatric genetics' communities in the 19th century. Although geographically often isolated in their rural asylums, alienists examining the hereditary of madness would appear to have been well in touch with the general themes of the nascent field of medical genetics.

The *second* aim of this article was to clarify what medical geneticists of the 19th century thought about psychiatric illness. Although our sampling is small, the results are clear-cut. All three of our authors saw madness as a paradigmatic example of a disorder with strong heritable influences. As demonstrated by two further quotes, it was also easy to find, in a brief survey of other texts on general medical genetics in the 19th century, additional references to the role of heredity in psychological traits and mental illness. In Todd's Encyclopedia of Practical medicine, published in 1839, the chapter on "generation" contains the following:

> … the qualities of mind are, perhaps as much as the bodily configuration and powers, subject to influence from the hereditary influence of parents upon their offspring … almost all forms of mental derangement are more of less directly hereditary, one of the parents or some near relation being affected (Thomson, 1839, p. 471).

In his 1857 "Medical Notes and Reflections," Sir Henry Holland, "physician in ordinary to the Queen and Prince Albert," notes in his section on "Hereditary Disease" that.

> Every physician will recognize the general tendency to hereditary character in disorders of the Brain and nervous system…from simple headache to the worst forms of epilepsy, apoplexy, and palsy…. The topic is, further, one of deep interest, as including the various conditions of hereditary insanity … (Holland, 1857, p. 44).

The belief that heritable factors played a strong role in the etiology of insanity was shared not only by alienists (Kendler, 2021c) but also by the wider young medical genetics community.

Third, I had hoped to learn about beliefs of the role of hereditary in the milder psychiatric disorders rarely seen in asylums. Here, only Lithgow provided much information. However, he was clear that heredity played an important role in a range of less severe psychiatric disorders, particularly hysteria and alcoholism. He also emphasized the importance of the neuropathic constitution which was substantially influenced by hereditary factors and often lead to a wide range of both mild and more severe psychiatric and neurological syndromes. Of historical interest, this concept – a heritable neuropathic constitution—play a strong role in degeneration theory (Kendler et al., 2022), and in early efforts to map Mendelian transmission patterns of psychiatric illness (Kendler, 2022; Rosanoff & Orr, 1911).

One obvious limitation of this exercise is that all three of our documents are from England. I have also consulted and written about two important French contributors to the 19th-century medical genetics literature: Prosper Lucas (Kendler, 2021b) who wrote his major monograph from 1847–1850 (Lucas, 1847, 1850) and Ribot who wrote in 1873 (Ribot, 1873) translated 2 years later (Kendler, 2021c; Ribot, 1875). The broad themes these authors discussed are congruent with the English authors we have reviewed. Indeed. Lithgow quotes frequently from Ribot.

CONFLICT OF INTEREST

The author reports no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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