

Narrative skills in autism and schizophrenia: a window on the relationship between the two pathologies

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Abstract The relationship between autism and schizophrenia has always been very controversial. Recently researchers have individuated 8 models of co-occurrence between the two pathologies. In this paper we will briefly describe them and we will analyze the explanatory possibilities of those most supported by the scientific literature: the 'associate liabilities' model and the 'diametrical' model. Those who support this latter model consider the patient's cognitive profile as a useful data for understanding the relationship between the two pathologies and find elements of diametrality in it. In this study we aim to contribute to the debate by evaluating the characteristics of narrative skills in the two clinical populations. From our analysis it emerged that a characteristics very important that has been considered diametrical, the relationship between hyper- and hypo- mentalization, should actually be reread in the light of a more general anomaly in the patient's relation with lived reality. The other features of the narrative, on the other hand, did not show a diametrical configuration between the two pathologies.

Keywords: Narratives, autism, schizophrenia, diametrical model, references

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0. Introduction

Autism and schizophrenia today belong to two different diagnostic categories in the DSM-V (APA 2013), but their relationship has always been very controversial. Between autism and schizophrenia there is a very high level of comorbidity: the 13,8% of persons with autism will also receive a diagnosis of schizophrenia in adulthood and the 24,1% of persons with schizophrenia also received a diagnosis of autism in childhood (Chisholm *et al.* 2015). The high level of comorbidity between the two pathologies has been recently confirmed through a very numerous sample (3837)(Yi-Ling *et al.* 2021).

Moreover, for both pathologies the anomalies in communication and social interactions have always been of primary importance.

This level of comorbidity between the two pathologies has always led researchers to question the nature of the link between them. In 1911 Eugen Bleuler, in his *Dementia Praecox oder die Gruppe der Schizophrenien* (Dementia praecox or the group of schizophrenias) considered autism as a central feature of schizophrenia and still today researchers do not agree on the relationship between the two pathologies.

A recent review of scientific literature made by Katherine Chisholm and collaborators found that there are eight alternative models of co-occurrence to explain this relationship (Chisholm *et al.* 2015).

In the next paragraph we will briefly explain these eight models and after we will argue that also the characteristics of narrative skills in patients can help researchers to better understand the link between autism and schizophrenia.

1. The models of co-occurrence between autism and schizophrenia

The eight models of co-occurrence individuated by Chisholm *et al.* (2015) are the 'multiformity' model, the 'chance' model, the 'stages' model, the 'independence' model, the 'increased vulnerability' model, the 'multiple overlapping aetiologies' model the 'associated liabilities' model and finally the 'diametrical' model.

According the 'multiformity' model, those pathologies that are usually considered two, are actually one pathology that assumes different forms. According to the 'chance' model, the co-occurrence of the two pathologies is completely accidental or linked to misdiagnosis, i.e. the reason why a higher number of co-occurrences is reported in the literature than would be normal is that those people who are already under the attention of doctors and so they are more likely to receive new diagnoses. In people without autism perhaps schizophrenia remains undiagnosed or vice versa, in people without schizophrenia autism does not emerge because it does not become problematic for society. According to the 'stages' model autism would be the stage that always precedes schizophrenia and the two pathologies are just one. According to the 'independence model', a comorbidity between two disorders it's a third disorder, so-in our case-if a subject with autism would receive a diagnosis of schizophrenia, he will develop a third disorder which is nor autism neither schizophrenia.

None of these potential models of co-occurrence are supported by the scientific literature for autism and schizophrenia. The following, on the contrary, are the most highly debated among researchers (*ivi*).

The 'increased vulnerability' model tries to explain the relationship between the two pathologies by supposing that one predisposes to the second one: as obesity usually predisposes to cardiac attack, autism can predispose to schizophrenia. In the last two decades, studies on the 22q11.2 deletion syndrome has been the main theoretical framework for this model. In fact, this syndrome is the strongest single genetic factor for the development of schizophrenia and other relate psychotic disorders (Karayiorgou *et al.* 2010). In children, the presence of 22q11DS has been associated with different neuropsychiatric disorders such as attention deficit hyperactivity disorder, anxiety disorders and above all Autism Spectrum Disorders (Schneider *et al.* 2014). Obviously, this co-occurrence has been considered as suspect. Two recent studies tested the possibility that children with 22q11DS should have more probability than children without this gene to develop schizophrenia or other related psychiatric disorders: both the retrospective (Vorstman *et al.* 2013) and the prospective (Fiksinki *et al.* 2017) study found no relationship between the presence of gene and/or of related disorders in

childhood and adolescence and the development of schizophrenia or related disorders in adulthood.

The ‘multiple overlapping aetiologies’ model can be applied to disorders that have high levels of clinical heterogeneity and multiple etiologies. According to this model, the co-occurrence of autism and schizophrenia is linked to the fact that part of these etiological pathways are shared between the two pathologies, while another part is not. Furthermore, according to this model, genetic research will lead to the isolation of different sub-groups among the members of the two clinical populations. The prediction of this model is that part of the traits will coincide between the two pathologies; another part does not. The research on sub-types of schizophrenia (Arnedo *et al.* 2015) and autism (Arnett *et al.* 2020) led to some interesting results; but this area of research is very controversial in practice, the scientific community tends towards a simplification of the sub-categories rather than towards the theoretical construction of new sub-types. In the DSM-IV there were four subtypes of autism (Asperger Syndrome, the disintegrative disorder of childhood, the pervasive development disorder and the autistic disorder); however, the reliability of the distinction between groups was too low and in the DSM-V these four subtypes became a unique category: Autism Spectrum Disorders (Reichenberg 2014).

In the next paragraph we will discuss the two remaining models: the ‘associated liabilities’ model and the ‘diametrical’ model.

2. Associated liabilities or diametrical characteristics?

According to the ‘associated liabilities’ model, autism and schizophrenia co-occur so frequently because they share both environmental and genetic risk factors, but they are two different disorders. According to this model, a subject who receives both the diagnosis of autism and the one of schizophrenia, would show more deficit than a subject who receives only one of the two diagnoses (Chisholm *et al.* 2015).

In support to this model there are the studies on risk factors, in fact autism and schizophrenia share some rare genetic configurations (Carroll and Owen 2009) and some modifiable risk factors that impact on brain development such as direct or indirect exposure to drugs, nutritional excesses or deficiencies, complications during pregnancy or advanced age of the father (Hamlyn *et al.* 2013).

The diametrical model, among those evaluated so far, is the one that most takes into account the cognitive characteristics of the participants. It suggests the existence of two opposite cognitive styles between autism and schizophrenia, which however can give rise to deficits in the same areas. Specifically, schizophrenic cognition would tend to think mainly in mentalistic terms (hyper-mentalization); while the autistic one would tend to think mainly in mechanistic terms (Abu-Akel and Bailey 2000; Crespi and Badcock 2008). According to this model, the two psychiatric disorders are at opposite ends of a continuum of mentalization, in which autism is characterized by a tendency to hypo-mentalize and schizophrenia by a tendency to hyper-mentalize.

In one of its best-known early formulations, that of Crespi and Badcock in 2008, this theory compared the relationship between autism and schizophrenia to the one between Prader-Willi syndrome and Angelman syndrome. Both pathologies are caused by mechanisms involving the 15 pair of chromosomes. In the somatic cell there are 23 pairs of chromosomes equal to two by two. In these pairs, one chromosome is inherited from the mother and one from the father. Since genes usually only need one of these two chromosomes, during gametogenesis one of these two chromosomes is silenced in a process called imprinting. When the mother's chromosome is imprinted in the 15 pair of chromosomes and a deletion occurs in the father's, the baby will develop Prader-Willi

Syndrome. This same syndrome occurs even if by chance a uniparental disomy is present in the cell, i.e. both chromosomes 15 are from the mother. Angelman syndrome is exactly the mirror image of Prader-Willi syndrome from the genetic point of view; since it occurs when in the pair 15 of chromosomes the father's chromosome is silenced by imprinting and the one of the mother has undergone a deletion; or in the cell there is a uniparental disomy with the father's chromosomes. The two pathologies present different symptoms.

Prader-Willi Syndrome implies that the newborn is born underweight, tends not to eat before weaning, is unable to suck the milk from the mother's breast properly, cries weakly, is not very active and very sleepy; after weaning, however, he begins to compulsively eat everything and in large quantities. Often in this syndrome there is also a growth hormone deficiency. The resulting short stature, associated with the tendency to compulsively eat, leads the subject to almost always develop severe forms of obesity. In adulthood, these individuals often develop psychotic spectrum disorders. Angelman syndrome in some respects involves symptoms diametrically to these, including a tendency to suck milk from the mother's breast for excessively long periods of time, frequent crying, hyperactivity and frequent awakenings. Speech is often absent in these children. Angelman syndrome is frequently associated with typical autism traits: social behavior deficit, reduced pursuit of eye contact, intolerance to change, repetitive and stereotyped behaviors.

Therefore, from a genetic point of view, two diametrical syndromes seem to be associated with diametrical behaviors in the child and this also applies to psychiatric traits.

Gene imprinting is a sort of tug-of-war between the expression of paternal genes and that of maternal genes. When there is a slight prevalence of paternal genes according to this theory, there is a greater growth and a tendency towards autonomy in the relationship with the mother; when, on the other hand, there is a prevalence in the expression of maternal genes, there is less growth and a greater tendency of the child to socialize with the mother. Alterations in this mechanism are usually associated with pathologies, as in the case just described. According to the diametrical model of schizophrenia and autism, when the alteration of this tug-of-war moves in favor of the expression of maternal genes, the child will tend to psychoticism; if, on the other hand, this tug-of-war will tend to favor the expression of the paternal genes, the child will tend to autism.

What is really interesting is that according to the authors, these opposite genetic causes correspond to opposite cognitive phenotypes: in table 1 we show a list of cognitive traits considered as diametrically opposite in autism and schizophrenia by Crespi and Badcock (2008).

Autistic Spectrum	Psychotic Spectrum
Deficit in eye contact	High gaze sensitivity, paranoia
Deficit in interpreting intention	Delusions of persecution, erotomania
Deficit in shared attention	Delusions of conspiracy
Deficits in personal agency	Megalomania
Theory of mind underdeveloped	Theory of mind overdeveloped
Hypoactivation in behavioral activation system in functional imaging	Hyperactivation in behavioral activation system in functional imaging
Reduced deactivation of resting network	Increased deactivation of resting network
Attention to details	Reduced filtering of stimulus relevance
Inner speech absent or reduced	Auditory hallucination and thought

	insertion
Enhanced visual spatial skills	Deficit in some visual spatial skills
Hyperlexia	Dyslexia

Table 1 Diametrical cognitive characteristics in autistic and in psychotic spectra; Crespi and Badcock 2008

3. Do narratives of persons with autism and of persons with schizophrenia have diametrical features?

Crespi and Badcock (2008) carry out a somewhat daring epistemological operation: starting from the genetic and behavioral complementarity between Prader-Willi Syndrome and Williams-Syndrome, they hypothesize that a phenotypic complementarity at a cognitive level may correspond to a genetic complementarity. Therefore, they collect a series of data on the cognitive profile of subjects within the autistic spectrum or within the psychotic spectrum and underline the elements of complementarity between the two. Among the competences placed within this scheme there are also, for example, the visual and spatial skills. In this paragraph we will try to understand if the narrative skills characteristics of people affected by these pathologies have diametrical characteristics or not.

3.1 Hypo- vs hyper- mentalization in narratives?

In 1944 Heider and Simmel created an experiment that is today considered a classic tool in cognitive psychology. In a video a big triangle, a small triangle and a small circle move themselves inside and outside a rectangle. Healthy people cannot avoid to humanize them and explain their behavior in mentalistic terms, by using sentences such as “the circle is afraid of the big triangle”.

Individuals with autism, unlike typically developed individuals, do not use mentalistic terms (neither emotional nor intentional) to narrate this scene (Klin and Jones 2006; 2000). I.e. how a 35-years old man with autism describe a scene of the video:

Starts when a small equilateral triangle breaks out of a square. A small sphere or circle appears and slides down the broken rectangle. The triangles were either equilateral or isosceles. Later the small, I think, isosceles triangle and sphere bounce around each other, maybe because of a magnetic field (Klin and Jones 2006: 49).

According to the diametrical model, subjects on the psychotic spectrum must use mentalistic terms, if not hyper-mentalize this scene. Instead, in 2009 Horan and collaborators found a behavior similar to that of patients with autism; that is, an absence of mentalization in the description of the scene. The same behavior showed paranoid schizophrenics at this test (Russell *et al.* 2005). We will come back on topic in §5.

3.2 The relation with reality

Autistic creativity has been described as characterized by a level of elaboration higher than the one of typically developed individuals (Pennisi *et al.* 2020). For “elaboration” authors mean the level of detail reached by each production; the indicator of the creator’s ability to represent a subject from a bottom-up perspective; its relationship with concrete aspects of reality.

When persons with autism read a story, they tend to infer the hidden content of them in physical terms, also if this is not the case. I.e. Bodner *et al.* (2015) posed to children and adolescents with and without ASD some open-ended questions to test their inferential abilities in narrative understanding. The examiner proposed stories like this “Andy was only 2 years old. He was sitting in his mother’s lap when a big dog ran up and licked him on the cheek. Andy’s eyes got really big, and he started to cry” (*ivi*) and asked to participants “Why did Andy do that?”, if TD participants gave them answers such as “Andy was scared of the dog”, participants with ASD gave answers such as “because the dog licked him”, so usually preferring a physical explanation to an emotional one. Clearly this tendency is due to their difficulties in mentalizing. But sometimes subjects with ASD gave incorrect answers such as “Andy is allergic to the dog”. In this case participants are creating an explanation that is not in line with reality, albeit a realistic one. All human beings tend to involuntarily create false explanations to events that are unexplainable for them (Chrobak and Zaragoza 2013). It is possible that even subjects with autism, since because of their difficulty in mentalizing, they do not understand many phenomena of the world and sometimes tend to tell the facts by inferring realistic but false data. This imperfect form of looking for realism is the very, non-objective, human realism (Newberg and Waldman 2007). Thus, in making inferences about the world of the mind, which for them is hard to be understood, people with autism show the same reality-creating biases that people typically have in narrating events of which they do not know some parts. Conversely, in making inferences that are necessary to narrate events in the physical world, people with autism show the same realism, and even more realism than typically developed persons (Pennisi 2016; Paganini and Gaido 2013; David *et al.* 2010).

On the contrary individuals with schizophrenia tend to frequently lack the link with concrete aspects of reality because of their delusions or hallucinations (APA 2013). This is a well-known phenomenon, here an exemplum of bizarre, persecutory delusion of a schizophrenic patient of Mandalari, the ex-mental hospital of Messina (Italy).

«Egregia R.A.I.T.V.

Come ti sei arbitrariamente presa l’interesse di sfruttare, al suo tempo, quanto hai voluto (teleguidandomi il cervello) adesso sii un po’ umana nell’avvisare i responsabile (Vaticano, politici, cantanti, cineasti e compagnia «bella»):

1) Desidero essere pagato di tutte le torture fisiche, morali e materiali subite. [...] Si chiede pure: che fini ha fatto la somma di denari che mi predestinarono i russi? Chi se l’ha presa?.....» (Pennisi 2018:430)

“Dear R.A.I.T.V.

How did you arbitrarily take the interest in exploiting, at the time, what you wanted (by remotely guiding my brain), now be a little human in informing those responsible (Vatican, politicians, singers, filmmakers and all of that):

1) I wish to be paid for all the physical, moral and material tortures I suffered. [...] It also require: what happened to the sum of money that the Russians predestined for me? Who took it? ...” (the English translation is our)

3.3 Formal characteristics of narratives in both clinical populations

Narratives of persons with autism, if compared with the ones of healthy subjects: (1) show fewer words and shorter expressions; (2) show fewer different words; (3) from a syntactic point of view are usually very simple; (4) show an inferior level of textual coherence and cohesion because of a lacking in causal links, referential accuracy,

episodic structure; (5) show fewer references to intentional or emotional states (Baixauli *et al.* 2016).

Since autism is almost always diagnosed in childhood, children are followed up in schools and this has allowed for the development of a rather solid literature on the subject. The data from Baixaiuli *et al.* (2016) meta-analysis is quite reliable. Things get more confusing when it comes to schizophrenia. Not being able to refer to a systematized literature as in the case of autism, we will analyze each of these characteristics individually.

- (1) According to Buck and Penn (2015), narratives of persons in the psychotic spectrum are usually normal in length, sometimes these are verbose (for some exempla of verbose schizophrenic narratives cfr. Pennisi 2011).
- (2) Persons with schizophrenia usually show a vocabulary in line with the one of healthy subjects, but they frequently use neologisms (Covington *et al.* 2005).
- (3) Syntax is preserved in schizophrenic narratives (Covington *et al.* 2005; Cardella 2018: 32-33).
- (4) Referential skills are preserved and sometimes persons with schizophrenia make an even superior use of personal pronouns than healthy subjects (Fineberg *et al.* 2015; Watson *et al.* 2012). Some authors reported some deficits in referential skills (Chaves *et al.* 2020); so, we will discuss with great attention the topic in the next paragraph. Usually thematic coherence is intact, however textual cohesion could lack because of deficit in associative links between sentences.
- (5) In narratives of persons with schizophrenia the references to emotional or intentional states are few in re-telling tasks (Russell *et al.* 2006; Horan *et al.* 2009; Langdon 2017); moreover, persons with schizophrenia have the tendency to see intentionality where there is no (if delusion is present), but contemporary they are frequently unable to translate the emotions of others into words (Kettle *et al.* 2008; Li *et al.* 2020). This inconsistency can be explained by our observations in §3.1

4. A little parenthesis on referential abilities in people with schizophrenia

As we seen in the previous paragraph, there is not agreement in the scientific community regarding the referential skills of people with schizophrenia. According to us, persons with schizophrenia do not show a specific deficit in referential skills. We think that this confusion derives from the fact that frequently, when studying schizophrenic narratives, scholars do not fully consider the education level of the patients. We will analyze a text took from the archive of Mandalari. This text is part of a memorial written by a schizophrenic woman in 1964. The woman presented delusions of grandeur, visual and auditory hallucinations. She was convinced that she was often an important figure such as a colonel of Finance, the King, the director of customs. She always said that she was called by God to make "profession", but who or what it is hase never been fully explained. The woman often spoke of an "entity" and when, one day, the doctors asked her to explain better what this entity was, the woman wrote a memorial. The following passage is taken from this memorial.

Io sono M.C. Sono corsa a Altolia dopo un risveglio che parevo morta dopo l'Ave Maria, fui ospitata da mia zia, in me una Mano che sembrava più Divina che Umana m(aveva detto vieni qui, nell'altro Mondo o corri professione in anticipo un uomo come Mio Marito (figura) più tardi il Diavolo mi diceva vengo da Monte Scuderi, ti portai le due Scuole Normali, nella corsa che andai da mia zia o di Mio marito, quella Mano Divina o Ente come viene chiamata del Mondo mi suggerì il

modo come dovevo correre Professione, una Brigata di Duchi o Fantasticheria come mi dicevano elli, Dio ti fa Professione, ti mandò le Scuole Normali con tuo marito, corri con le nostre Visioni, ti daranno coraggio, ti tubavo sa perché Esimio Dottore? Ero ammalata la mia fantasia mi diceva di stare. [...] (Pennisi 2018: 318).

I am M.C. I ran to Altolia after an awakening that I seemed dead after the Ave Maria, I was hosted by my aunt, in me a Hand that seemed more Divine than Human (said to me come here, in the other World or run profession in advance a man as My Husband (figure) later the Devil told me I come from Monte Scuderi, I took you the two Normal Schools, in the race that I went to my aunt or my husband, that Divine Hand or Entity as it is called of the World suggested me the way how I had to run Profession, a Brigade of Dukes or Reverie as they told me, God makes you Profession, he sent you the Normal Schools with your husband, run with our Visions, they will give you courage, I cooed do you know why Dear Doctor? I was sick my fantasy told me to stay. [...] (the English translation is our)

As we said in §3.2, frequently schizophrenic narratives lack in cohesion because of the lacking of sequential links among sentences. In this text, in fact, in the sequence of events something does not work: i.e. the woman is and, at the same time, is going to her aunt. The evident absence of links and boundaries between the sentences or sometimes the syntagms makes the text very difficult to understand. But by adding some of them, we will partially restore the narrative:

I am M.C., I ran to Altolia after an awakening that I seemed dead. After the Ave Maria, I was hosted by my aunt, in me a Hand that seemed more Divine than Human (said to me “come here, in the other World or run Profession” ~~in advance a man as My Husband (figure)~~ later the Devil told me “I come from Monte Scuderi, I took you the two Normal Schools”, in the race that I went to my aunt or my husband, that Divine Hand or Entity, as it is called ~~of~~ by the World, suggested me the way how I had to run “Profession, a Brigade of Dukes or Reverie as they told me, God makes you Profession, he sent you the Normal Schools with your husband, run with our Visions, they will give you courage”, I cooed you, do know why Dear Doctor? I was sick and my fantasy told me to stay. [...] (the modified parts have been underlined or cut off so that they remain visible)

Now we can observe the use of personal reference and to note that there are no mistakes in the use of personal reference. The objective of the patient is very ambitious: describing this delusion is not at all easy because there are several characters such as God, the brigade of dukes, the husband, the aunt, the doctor. Once the causal links between sentences or syntagms have been re-established, each reference seems quite clear even if, sometimes, the passage from one subject of the reference to the other is abrupt. In the end, for example, while we are immersed in the story of how the brigade of dukes suggests that she had to run with their visions, which will give her courage, the narrator abruptly interrupts to explain to the doctor why she “cooed” him.

5. Conclusions

The distribution of narrative skills in the two clinical populations is not diametrical. The classical opposition made between hypo- and hyper- mentalization in the two clinical populations appears fallacious in light of tests conducted with the Heider and Simmel movie: persons with schizophrenia do not hyper- mentalize the movements of polygons, their narratives were similar to the ones of persons with autism. Maybe, rather than speaking of hyper-mentalization, we must imagine a general tendency of the

subject with schizophrenia to orient the self-narration of reality (including the mental world of those around them) to beliefs related to delusion. If to build delusion it is necessary to attribute mental or intentional states to others even where there are none, the schizophrenic will do it ... but if instead for the construction of delusion it is not necessary to attribute mental states where there are none, then it will not be done!

And in fact, the only characteristic that appears to be diametrical between the two clinical populations is the relation with reality. In persons with autism the need for concreteness and the difficulties in generalizing often makes them capable of hyper-realistic creations, for example in drawings (Pennisi 2016b). In their narratives persons with autism maintain an intact, if not above average, realism when the object of the narratives is the physical world, while they exhibit mental world narrative bias similar to those shown by healthy people when these last are narrating something they do not fully understand or know. On the contrary, persons with schizophrenia often build bizarre narration of their own life in their delusions.

Both clinical populations tend to create neologisms; apart for this, the formal features of their narratives do not seem related: in persons with schizophrenia the length of texts and of sentences, vocabulary, syntax and reference attribution are preserved. So, these characteristics are not over- neither under- developed; in narratives of persons with autism, on the contrary all of them are under-developed.

The study of the narratives, at the present state of knowledge, does not seem to show a diametrical configuration in the cognitive profile of the two clinical populations. Of course, this does not mean that they cannot be genetically diametrical or diametrical for other cognitive aspects. Certainly, from this study it emerges that the presumed contrast between the tendency to hypo- and the tendency to hyper- mentalize must be systematically compared with the relationship that clinical populations have with reality. In this last aspect of cognition, rather than in others, as we hope to have shown, the two groups appear diametrically opposed.

References

Abu-Akel, Ahmand M., Wood, Stephen J., Hansen, Peter C., & Apperly, Ian A. (2015) «Perspective-taking abilities in the balance between autism tendencies and psychosis proneness», in *Proceedings of the Royal Society B: Biological Sciences*, 282, 1808, 20150563.

American Psychiatric Association (2013), *Diagnostic and statistical manual of mental disorders: DSM-5*, Arlington, VA.

Arnett, Anne B., Beighley, Jennifer S., Kurtz-Nelson, Evangeline C., Hoekzema, Kendra, Wang, Tianyun, Bernier, Raphe A., & Eichler, Evan E. (2020), «Developmental predictors of cognitive and adaptive outcomes in genetic subtypes of autism spectrum disorder», in *Autism Research*, 13, 10, pp. 1659-1669.

Baixauli, Immaculada, Colomer, Carla, Roselló, Belén, & Miranda, Ana (2016), «Narratives of children with high-functioning autism spectrum disorder: A meta-analysis», in *Research in Developmental Disabilities*, 59, pp. 234-254.

Bleuler, Eugen (1911), *Dementia praecox oder Gruppe der Schizophrenien*, F. Deuticke, Leipzig und Wien, 420 Seiten. Erstdruck.

Buck, Benjamin, & Penn, David L. (2015), «Lexical characteristics of emotional narratives in schizophrenia: relationships with symptoms, functioning, and social cognition», in *The Journal of nervous and mental disease*, 203, 9, p. 702.

Cardella, Valentina (2018), *Language and schizophrenia: Perspectives from psychology and philosophy*, Routledge, New York .

Carroll, Liam S., Owen, Michael J. (2009), «Genetic overlap between autism, schizophrenia and bipolar disorder», in *Genome medicine*, 1, 10, pp. 1-7.

Chaves, Monica, Mota, Natália, Ribeiro, Sidarta, Copelli, Mario, Rodrigues, Cilene (2020), «M190. Use of null pronouns in schizophrenia», in *Schizophrenia Bulletin*, 46, Suppl 1, S208.

Chien, Yi-Ling, Wu, Chi-Shin S., Tsai, Hhui-Ju (2021), «The comorbidity of schizophrenia spectrum and mood disorders in autism spectrum disorder», in *Autism Research*, 14, 3, pp. 571-581.

Chisholm, Katharine, Lin, Ashleigh, Abu-Akel, Ahmad, Wood, Stephen J. (2015), «The association between autism and schizophrenia spectrum disorders: A review of eight alternate models of co-occurrence», in *Neuroscience & Biobehavioral Reviews*, 55, pp. 173-183.

Chrobak, Quin M., & Zaragoza, Maria S. (2013), «When forced fabrications become truth: Causal explanations and false memory developments», in *Journal of Experimental Psychology: General*, 142, 3, p. 827.

Covington, Michael A., He, Congzhou, Brown, Cati, Naçi, Lorina, McClain, Jonathan T., Fjordbak, Bess Sirmon, Semple, James, Brown, John (2005), «Schizophrenia and the structure of language: the linguist's view», in *Schizophrenia research*, 77, 1, pp. 85-98.

Crespi, Bernard, & Badcock, Christopher (2008), «Psychosis and autism as diametrical disorders of the social brain», in *Behavioral and brain sciences*, 31, 3, pp. 241-261.

David, Nicole, Aumann, Carolin, Bewernick, Bettina H., Santos, Natacha S., Lehnhardt, Fritz-G., Vogeley, Kai (2010), «Investigation of mentalizing and visuospatial perspective taking for self and other in Asperger Syndrome», in *Journal of Autism and Developmental Disorders*, 40, 3, pp. 290–299.

Fiksinski, Ania M., Breetvelt, Elemi J., Duijff, Sasja N., Bassett, Anne S., Kahn, R. S., Vorstman, Jacob A. S. (2017), «Autism Spectrum and psychosis risk in the 22q11. 2 deletion syndrome. Findings from a prospective longitudinal study» in *Schizophrenia research*, 188, 59-62.

Fineberg, Sarah Kathryn, Deutsch-Link, Sasha, Ichinose, Megan, McGuinness, T., Bessette, Ana J., Chung, Cindy K., & Corlett, Philip R. (2015), «Word use in first-person accounts of schizophrenia», in *The British Journal of Psychiatry*, 206, 1, pp. 32-38.

Hamlyn, Jess, Duhig, Michael, McGrath, John, Scott, James (2013), «Modifiable risk factors for schizophrenia and autism—shared risk factors impacting on brain development», in *Neurobiology of disease*, 53, pp. 3-9.

Heider, Fritz, Simmel, Marianne (1944), «An experimental study of apparent behavior», in *The American journal of psychology*, 57, 2, pp. 243-259.

Horan, William P., Nuechterlein, Keith H., Wynn, Jonathan K., Lee, Junghee, Castelli, Francesco, Green, Michael F. (2009), «Disturbances in the spontaneous attribution of social meaning in schizophrenia», in *Psychological medicine*, 39, 4, pp. 635-643.

Karayiorgou, Maria, Simon, Tony J., Gogos, Joseph A. (2010), «22q11. 2 microdeletions: linking DNA structural variation to brain dysfunction and schizophrenia», in *Nature Reviews Neuroscience*, 11, 6, pp. 402-416.

Kettle, Jonathan W., O'Brien-Simpson, Laurie, Allen, Nicholas B. (2008), «Impaired theory of mind in first-episode schizophrenia: comparison with community, university and depressed controls», in *Schizophrenia research*, 99, 1-3, pp. 96-102.

Klin, Ami, Jones, Warren (2006), «Attributing social and physical meaning to ambiguous visual displays in individuals with higher-functioning autism spectrum disorders», in *Brain and cognition*, 61, 1, pp. 40-53.

Langdon, Robyn, Flynn, Michaela, Connaughton, Emily, & Brüne, Martin (2017), «Impairments of spontaneous and deliberative mentalizing co-occur, yet dissociate, in schizophrenia», in *British Journal of Clinical Psychology*, 56, 4, pp. 372-387.

Li, Tai-Shan, Liu, Chih-Min, Liu, Chen-Chung, Hsieh, Ming H., Lin, Yi Ting, Wang, En Nan, Hwang, Tzung-Jeng, Chou, Tai-Li (2020), «Social cognition in schizophrenia: A network-based approach to a Taiwanese version of the Reading the Mind in the Eyes test», in *Journal of the Formosan Medical Association*, 119, 1, pp. 439-448.

Newberg, Andrew, Waldman, Mark Robert (2007), *Born to believe: God, science, and the origin of ordinary and extraordinary beliefs*, Simon and Schuster.

Paganini, Chiara, Gaido, Davide (2013), «Perception in autism: An interactive global research between folk psychology and folk physics», in *Journal of Social, Evolutionary, and Cultural Psychology*, 7, 2, pp. 175–195.

Pennisi, Paola (2016b), «What the autistic style of drawing says about the development of language?», in *RSL, Italian Journal of Cognitive Sciences*, n. 10, anno 5, 2/2016.

Pennisi, Paola (2016), «Inferential abilities and pragmatic deficits in subjects with Autism Spectrum Disorders», in Allan, K., Capone, A., Keckes, I., *Pragmemes and theories of language use*, Springer, Cham, pp. 749-768.

Pennisi, Paola, Giallongo, Laura, Milintenda, Giusy, Cannarozzo, Michela (2021), «Autism, autistic traits and creativity: a systematic review and meta-analysis», in *Cognitive Processing*, 22, 4, pp. 733-733.

Pennisi, Paola (2011), *Immagini dal Mandalari, rappresentazioni ed estetiche della follia tra Otto e Novecento*, Edas, Messina 2018.

Reichenberg, Lourie W. (2013), *DSM-5 Essentials: The savvy clinician's guide to the changes in criteria*, John Wiley & Sons.

Russell, Tamara A., Reynaud, Emanuelle, Herba, Catherine, Morris, Robin, Corcoran, Rhiannon (2006), «Do you see what I see? Interpretations of intentional movement in schizophrenia», in *Schizophrenia research*, 81, 1, pp. 101-111.

Schneider, Maude, Debbané, Martin, Bassett, Anne S., Chow, Eva W., Fung, Wai Lun Alan, Van Den Bree, Marianne B., Michael Owen, M.D., Ph.D., Kieran C. Murphy, M.D., Ph.D., Maria Niarchou, Ph.D., Wendy R. Kates, Ph.D., Kevin M. Antshel, Ph.D., Wanda Fremont, M.D., Donna M. McDonald-McGinn, M.S., C.G.C., Raquel E. Gur, M.D., Ph.D., Elaine H. Zackai, M.D., Jacob Vorstman, M.D., Ph.D., Sasja N. Duijff, Ph.D., Petra W.J. Klaassen, M.Sc., Ann Swillen, Ph.D., Doron Gothelf, M.D., Tamar Green, M.D., Abraham Weizman, M.D., Therese Van Amelsvoort, M.D., Ph.D., Laurens Evers, M.D., Erik Boot, M.D., Ph.D., Vandana Shashi, M.D., Stephen R. Hooper, Ph.D., Carrie E. Bearden, Ph.D., Maria Jalbrzikowski, Ph.D., Marco Armando, M.D., Ph.D., Stefano Vicari, M.D., Declan G. Murphy, M.D., Opal Ousley, Ph.D., Linda E. Campbell, Ph.D., Tony J. Simon, Ph.D., Stephan Eliez, M.D., and for the International Consortium on Brain and Behavior in 22q11.2 Deletion Syndrome (2014) «Psychiatric disorders from childhood to adulthood in 22q11. 2 deletion syndrome: results from the International Consortium on Brain and Behavior in 22q11. 2 Deletion Syndrome», in *American Journal of Psychiatry*, 171, 6, pp. 627-639.

Vorstman, Jacob A., Breetvelt, Elemi J., Thode, Kirstin I., Chow, Eva W., Bassett, Anne S. (2013), «Expression of autism spectrum and schizophrenia in patients with a 22q11. 2 deletion», in *Schizophrenia research*, 143, 1, pp. 55-59.

Watson, Andrew R., Defterali, Çağla, Bak, Thomas H., Sorace, Antonella, McIntosh, Andrew M., Owens, David G., Eve C. Johnstone, Lawrie, Stephen M. (2012), «Use of second-person pronouns and schizophrenia», in *The British Journal of Psychiatry*, 200, 4, pp. 342-343.