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Disorder of the personality: a possible factor of risk for the dementia

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Objectives. The fact that more and more people suffer from dementia makes it very important to know the different risk factors to prevent their appearance. The objective of this article is to study personality disorder as a possible risk factor for the onset of an insane process, and to relate personality disorders of Cluster B and dementia.

Methodology. A systematic review and meta-analysis was carried out with scientific literature published up to 2015.

Results. Twelve of the articles that we found met the specified criteria of selection and quality and study the relationship between a personality disorder and the emergence of a dementia. Although with the studies made so far it can't be concluded that the first one is a risk factor for the second one, it has been noted, thanks to neuroimaging techniques, that patients with Cluster B personality disorders develop alterations in brain structures (in the prefrontal, temporal and parietal cortex, as well as an alteration in the NAA levels and the grey matter levels) and which are also involved in a demented process.

Conclusions. Definitely, the patients with medical record of the borderline or narcissistic personality disorder present more alterations in the brain structures mentioned, such that presenting these types of personality disorders could increase the risk of developing dementia in the future.

Keywords: Personality disorder, Dementia, Meta-analysis, Odds Ratio

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Trastorno de la personalidad: un posible factor de riesgo para la demencia

Objetivos. El hecho de que cada vez haya más personas que padezcan demencia hace que sea muy importante conocer los diferentes factores de riesgo para prevenir su aparición. El objetivo de este artículo es estudiar el trastorno de la personalidad como posible factor de riesgo para la aparición de un proceso demencial, y relacionar trastornos de la personalidad del Clúster B y demencia.

Metodología. Se realizó una revisión sistemática y metaanálisis con literatura científica publicada hasta el año 2015.

Resultados. Doce de los artículos que se encontraron cumplían con los criterios de selección y calidad especificados y estudian la relación entre un trastorno de personalidad y la aparición de una demencia. Aunque con los estudios hechos hasta el momento no se puede concluir que el primero sea un factor de riesgo para el segundo, sí que se ha podido observar, mediante técnicas de neuroimagen, que los pacientes con trastornos de personalidad del Clúster B desarrollan alteraciones en estructuras cerebrales (en la corteza prefrontal, temporal y/o parietal, además de una alteración en los niveles de N-acetil Aspartato y de sustancia gris) que también están implicadas en un proceso demencial.

Conclusiones. En definitiva, los pacientes con historia clínica de trastorno límite o trastorno narcisista de la personalidad presentan más alteraciones en las estructuras cerebrales mencionadas, de tal manera que presentar este tipo

de trastornos de la personalidad podría aumentar el riesgo de padecer demencia en un futuro.

Palabras clave: Trastorno de la personalidad, Demencia, Metaanálisis, Odds Rati

INTRODUCTION

The increase in life expectancy of the population has resulted in a gradual rise in the number of people with some type of dementia. It is therefore of interest to explore the associated risk factors with a view to reducing the appearance of disorders of this kind.

Some studies[1] have related the five basic personality domains (the so-called Big Five) described by Costa and McCrae[2] to an increased risk of dementia; specifically, high Emotional Instability or Neuroticism scores (N) and low Openness (O), Extraversion (E), Agreeableness (A) and Conscientiousness scores (C) could increase the risk of appearance of the syndrome. Another study[3] has explored the separate and combined effects of neuroticism and extraversion upon the risk of dementia, while also taking the lifestyle of the individual into account. This study showed low neuroticism scores to be associated to a lesser risk of dementia only in subjects with a sedentary lifestyle or who are socially isolated. In contrast, the same was not observed for extraversion. Rather, the combination of low neuroticism and high extraversion scores was significantly associated to a decreased risk of dementia among individuals with an inactive lifestyle or who are socially isolated, but not in those with an active lifestyle and who are socially integrated.

Other studies[4] have associated emotional personality traits such as having a symbiotic relationship with other people, a lack of ego energy, a frail personal identity and also insufficient elaborative capacity in response to the aging process with an increased risk of dementia.

The causes of dementia are multiple and diverse. Alzheimer's disease is the most frequent cause, followed by vascular dementia, Lewy body dementia and frontotemporal degeneration. Mixed or coexisting forms are also common.

According to the DSM-IV-TR, a personality disorder is a permanent behavior and internal experience pattern that deviates markedly from the culture-based expectations and manifests in at least two of the following areas: cognition, affectivity, interpersonal functioning and control of impulses. These diagnostic criteria classify personality disorders into Cluster A (odd or eccentric profile: paranoid, schizoid, schizotypal), Cluster B (dramatic, emotional, erratic profile: antisocial, borderline, narcissistic, histrionic) and Cluster C (anxious, fearful profile: obsessive-compulsive, due to dependency, avoidance). According to the DSM-IV-TR, dependent personality disorder (1.6-6.4%) is the most common presentation in the general population, followed by histrionic (2-3%), antisocial (1-3%), borderline (>2%), paranoid (0.5-2.5%) and narcissistic personality disorder (<1%). These percentages increase in the case of the clinical population. Of all the mentioned personality disorders, we will focus our attention on the personality disorders of Cluster B, since this is the cluster showing the greatest association to dementia in the selected articles.

The psychobiological model of personality disorders developed by Cloninger[5] explains personality through three phases: temperament, self (temperament and character) and coherence (body, mind and spirit). At clinical level, the studies confirm that the dimensions of temperament allow differentiation of the personality disorder subtypes defined by the DSM-IV-TR. The three types of personality clusters are associated to a concrete dimension of temperament. Specifically, Cluster B[6-17] is related to a craving for novelty.

In recent years different studies have been made of risk factors for the development of dementia, such as depression, stress, lifestyle, diabetes, smoking, etc. However, despite the relationship between personality and health, there are not many studies on personality disorders as possible risk factors for dementia[14].

The relationship between personality and dementia is complex, since in the early phases of the disease 90% of all patients[18] may develop behavioral and personality disturbances, and this could mask the existence of a personality disorder or alterations secondary to dementia syndrome. Incorrect diagnoses are sometimes established as a result of this, and it may be unclear whether the patient suffers an accentuated personality disorder or early stage dementia. Likewise, it has been reported that initial personality changes often occur early or even before a clinical diagnosis of Alzheimer's disease is established[19]. Such changes would comprise increased rigidity, greater apathy, alterations of emotional control and increased egocentrism. In some cases we may even find an undiagnosed personality disorder preceding the dementia process.

At present it is not possible to confirm the hypothesis that personality disorder intrinsically constitutes a risk factor for dementia, despite the observation of a possible relationship between the two conditions. Specifically, studies have been made of the cerebral structures and mechanisms affected in both personality disorder and dementia. Both conditions appear to be characterized by alterations of the orbitofrontal cortex, the parietal and temporal lobes, gray matter, serotonin (5-HT) system, and N-acetyl aspartate (NAA) concentrations, etc. Thus, clearly establishing which

structures are affected in both disorders will bring closer to either confirming or refuting our starting hypothesis. For this reason we decided to conduct a meta-analysis of different literature sources found in scientific databases with the purpose of defining which altered brain structures are implicated in Cluster B personality disorders and in dementias. The study also more specifically explores the possible relationship between some of the Cluster B personality disorders and the development of dementia.

MATERIAL AND METHODS

We first conducted systematic search of the scientific literature with the aim of investigating the relationship between personality disorder and the future development of dementia.

We fundamentally searched PubMed and PsycINFO, using the following descriptors: "Borderline personality and dementia", "Borderline personality and Alzheimer", "Histrionic personality and Alzheimer", "Antisocial personality and dementia", "Narcissistic disorder and frontotemporal dementia", "Narcissistic personality and Alzheimer", "Antisocial personality disorder and frontotemporal dementia".

The search yielded 20 articles that were evaluated using the following screening and quality criteria based on the PRISMA statement[20]:

1. Articles addressing personality disorders (Cluster B) and brain structural alterations and/or dementia.
2. Exclusion of personality disorders due to the presence of tumors or other diseases such as dissociative amnesia.
3. Year of publication between 2000 and 2015.
4. Articles published in scientific journals with a significant impact factor (Psychiatry, International Psychogeriatrics, The Journal of Neuropsychiatry and Clinical Neurosciences, Biological Psychiatry, Psychology Press, Elmer Press, Journal of Psychiatric Research, Austin Journal of Clinical Neurology, Behavioural Neurology).
5. Articles describing methods and procedures in sufficient detail to allow replication by other investigators (type of patients and sample size, instruments and tools used, etc.)
6. Use of personality disorder and dementia measurement instruments of recognized validity and reliability (International Personality Disorder Examination [IPDE], Minnesota Multiphase Personality Inventory [MMPI], SCID-II Personality Questionnaire, Pathological Narcissism Inventory [PNI], DSM-IV-TR, Mini-Mental State Examination [MMSE]).
7. Studies contributing theoretical or practical results useful to society.
8. Adequate case presentation of single-case studies.
9. Compliance with deontological standards and principles.
10. Pertinence of the literature references.

In most investigations the sample size and year of publication of articles in scientific journals are considered to be very important. However, in studies of this kind it is difficult to find publications involving large samples. In any case, our small sample size (20 publications) does not necessarily imply that the articles are scantly reliable. On the other hand, few studies of personality disorder and dementia have been made to date; as a result, it becomes necessary to consult early publications – though always placing priority on the most recently published information.

We first conducted a general search of the scientific literature published up until 2015. A total of 360 articles of relevance to the study were identified, though 340 were excluded because they failed to relate personality disorders to either dementia or to alterations of concrete brain structures. The remaining 20 publications were evaluated in detail, and 8 of them were discarded because they failed to address the relationship between Cluster B personality disorders and dementia. A total of 12 articles published between 2001-2015 were thus finally selected for the meta-analysis: 7 referred to borderline disorder, three to narcissistic disorder, one to antisocial disorder and one to histrionic disorder.

A flow chart detailing the screening and evaluation steps is shown in Figure 1.

Data extraction was performed after reading and analyzing the articles. On one hand we compiled odds ratios (ORs) and hazard ratios (HRs) from studies involving multiple cases, and on the other produced summarizing tables for single-case studies. After analyzing all the information, the results were interpreted and described in detail. The steps followed are described below:

1. Literature search based on the screening criteria
2. Selection of articles according to quality for the meta-analysis
3. Analysis and interpretation of the data from studies involving multiple cases
4. Analysis and interpretation of the data from single-case studies
5. Discussion of the results obtained
6. Additional literature search to facilitate explanation of the results

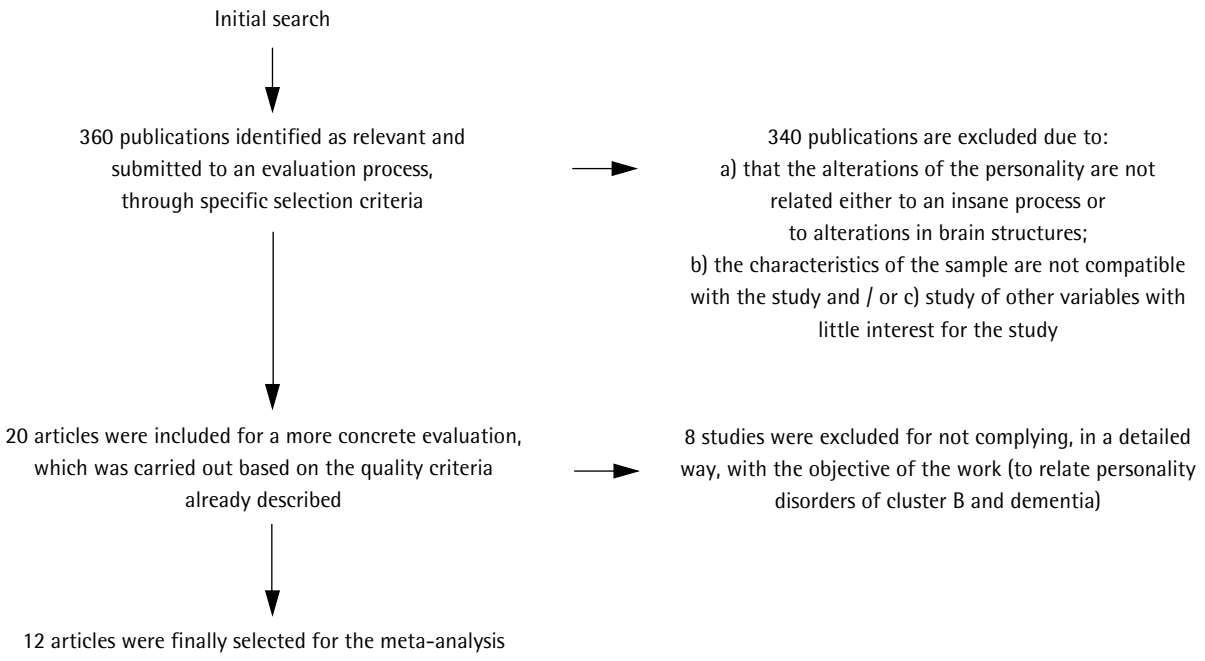

Figure 1 | *Procedure for selecting articles for the meta-analysis*

RESULTS

The 12 selected articles evaluated the relationship between brain alterations in personality disorders and different forms of dementia. The analysis of the studies revealed an association between Cluster B personality disorder and alterations of the orbitofrontal cortex and gray matter, as well as low N-acetyl aspartate (NAA) concentrations. In addition, alterations of the serotonin (5-HT) system were observed, as well as cerebral blood flow disorders – specifically in the posterior cingulate cortex, hippocampal circumvolution and insula.

The different Cluster B personality disorders and associated brain alterations are described below. The results obtained from the single-case studies are commented, and the odds ratios obtained from the analysis of the articles involving multiple cases are described (Table 1).

Borderline personality disorder

With regard to borderline personality disorder, 7 of the studies recorded alterations in brain structures and even the possible associated development of dementia. The two single-case studies found that patients previously diagnosed with borderline personality disorder started to develop typical symptoms of frontotemporal degeneration by 46-59 years of age[6-7]. Based on cerebral neuroimaging techniques, magnetic resonance imaging (MRI) and positron emission tomography (PET), significant atrophy was identified of the parietal and temporal lobes ($p<0.005$), together with hypometabolism in the temporal, frontal and prefrontal lobes. Specifically, these structures showed a 20% decrease with respect to the control group[6].

On the other hand, 5 of the studies involving multiple patients with borderline personality disorder recorded lessened activation of the medial orbitofrontal cortex, associated with the inhibition of negative emotions, compared with the control group[8]. Lastly, both patients with borderline personality disorder and those with dementia exhibited low NAA concentrations. Specifically, patients with this type of personality disorder appeared to present 19% less NAA in the dorsolateral prefrontal cortex than the controls[9-10].

Narcissistic personality disorder

With regard to narcissistic personality disorder, three of the studies reported alterations in the mentioned brain structures, as well as the development of dementia. Specifi-

Table 1 Summary of the main characteristics of the meta-analysis studies

Study	Year of publication	Sample size	Statistical method	Dependent variables	Conclusion
Salzbrenner et al.	2009	Single case (46 years old)	MMSE (1), FBI (2) scores and comparison neuroimaging tests	Frontotemporal dementia (FTD)	Patients diagnosed with Borderline Personality Disorder (BPD) subsequently developed Frontotemporal dementia (FTD). Neuroimaging tests showed atrophy in the parietal and temporal lobes and hypometabolism of the temporal and frontal lobe (prefrontal)
Helmes et al.	2010	Single case (59 years old)	Percentile scores: WASI (3), WMS-III (4), RCFT (5), D-KEFS (6), PAI (7)	Dementia	Patients with a diagnosis of Borderline Personality Disorder (BPD) subsequently suffered from dementia. Magnetic Resonance (MR) and PET showed prefrontal, parietal and temporal alterations
Silbersweig et al.	2007	16 BPD and 14 controls	SMA (8); contrasts, analysis covariance, Pearson correlation (p)	Alterations in the frontolimbic cortex	Patients with BPD developed frontolimbic dysfunctions typical of dementia
Tebartz et al.	2001	12 BPD	Pearson correlation (p) and T-Student	Alterations N-Acetyl Aspartate (NAA) in prefrontal cortex	From neuroimaging tests, it was observed that patients with BPD present 19% less NAA in the dorsolateral prefrontal cortex in relation to the control subjects. These alterations can be seen in dementias
Schmahl et al.	2006	10 BPD and 20 controls	Pearson correlation (p)	Alterations N-Acetyl Aspartate (NAA) in prefrontal cortex. Alteration in amygdala	According to the neuroimaging, MR and PET tests, patients with BPD present 19% less NAA in the dorsolateral prefrontal cortex in relation to the control subjects. In addition, it is observed that patients with BPD present alterations in the amygdala. The alterations mentioned can also be observed in demential processes
Arza et al.	2009	26 BPD	Score (Direct Score -DS-) neuropsychological battery (verbal FAS, Stroop, etc.)	Prefrontal dysfunction	Subjects with BPD may present with neurocognitive alterations that suggest a specific affectation of the prefrontal areas. These dysfunctions could partially explain the behavioral changes of these patients

Table 1 Continuation

Study	Year of publication	Sample size	Statistical method	Dependent variables	Conclusion
Hazlett et al.	2005	50 BPD	Interclass correlation coefficient. Analysis of variance (ANOVA)	Gray matter alteration (anterior and posterior cingulate cortex)	Patients with BPD present alterations in the gray matter of the anterior and posterior cingulate cortex. These alterations can also be observed frequently in the Schizotypal Personality Disorder (STPD). In addition, it is very important to continue studying these affectations, since they can also occur in dementia
Hellwig et al.	2011	Single case (61 years old)	Standard score (z), Pearson correlation (p)	Progressive deterioration in the short term. Alzheimer's	Patients with Alzheimer's disease may have a history of Histrionic Personality Disorder (HPD), in addition to presenting histrionic personality traits in the early stages of the disease. That is why, sometimes, it becomes difficult to establish a diagnosis between HPD and dementia
Nakano et al.	2006	22 FTD and 76 controls	Pearson correlation (p), correlation analysis.	Frontotemporal dementia (FTD)	The antisocial behavior of patients with FTD is associated with the deterioration of the orbitofrontal cortex. Therefore, Antisocial Personality Disorder (APD) could be related to FTD
Schulze et al.	2013	17 NPD and 17 controls	SPSS; Pearson correlation (p), t-test, Cohen's d and r.	Gray matter alteration	Subjects with Narcissistic Personality Disorder (NPD) have anomalies in frontal-paralímbic structures, specifically in gray matter levels. These alterations can be observed in demential processes
Serrani	2015	452 NPD	STATA *: Regression and Hazard Ratio Analysis	Alzheimer's	Narcissistic personality traits could be considered a risk factor for dementia, specifically for Alzheimer's
Poletti et al.	2011	Single case (73 years old)	Direct score (DS) of the psychometric test: FBI	Frontotemporal dementia (FTD)	Presenting narcissistic personality traits could be related to FTD. For this reason, it is very important to carry out longitudinal studies with these patients, in order to evaluate the cognitive changes indicative of a neurodegenerative process

1. Mini-Mental State Examination (MMSE; Lobo et al., 1979), 2. Frontal Behavioral Inventory (FBI; Kertesz et al., 1997), 3. Wechsler Abbreviated Scales of Intelligence (WASI; Psychological Corp., 1999), 4. Wechsler Memory Scale, third edition (WMS-III; Wechsler, 1997), 5. Rey Complex Figure Test (RCFT; Meyers and Meyers, 1995), 6. Delis-Kaplan Executive Function System (D-KEFS; Delis et al., 2001), 7. Personality Assessment Inventory (PAI; Morey, 1991), 8. SMA: Statistical Mapping Analyses.

cally, one of the studies involved a 73-year-old patient with borderline and/or narcissistic personality disorder who developed bilateral prefrontal and temporal hypometabolism at around 70 years of age.

In relation to the studies involving multiple cases, patients with this type of personality disorder showed abnormal function of certain brain structures such as the anterior insula, together with a significantly reduced presence of gray matter in this same zone ($p<0.005$)[14,15]. Due to alterations of the dorsolateral prefrontal cortex and anterior cingulate cortex, patients with narcissistic personality disorder have problems in adequately regulating emotions and empathy.

One of the articles on narcissistic personality disorder and dementia found the existence of narcissistic personality traits to be significantly associated to an increased risk of dementia, specifically in the form of Alzheimer's disease (HR [95%CI] = 1.43 [1.34-1.69])[15].

Histrionic personality disorder

With regard to histrionic personality disorder, one of the single-case studies likewise reported an association to dementia. This was a 61-year-old woman with no family history of personality disorder or dementia, in whom the neuroimaging studies revealed bilateral temporoparietal and frontal hypometabolism. These alterations are commonly affected in patients with different forms of dementia.

In another case involving a patient with Alzheimer's disease and a clinical history of histrionic personality disorder, the PET scan revealed bilateral temporoparietal hypometabolism, as well as hypometabolism in the posterior cingulate cortex. Another important finding was an anomalously high Tau protein concentration (64 pg/ml) in the cerebrospinal fluid[17].

The relationship between histrionic personality disorder and dementia has been documented, since in many cases the former is masked within the dementia process. It is therefore very important to establish a correct differential diagnosis between personality disorder and incipient dementia.

Antisocial personality disorder

Lastly, antisocial personality disorder has been related to dementia in the same way as in the other Cluster B personality disorders commented above[15]. One of the studies involving multiple patients postulated that individuals with antisocial personality disorder have less cerebral blood flow than the controls, as a consequence of orbitofrontal damage. Furthermore, a positive correlation has been observed between diminished cerebral blood flow and the possible subsequent development of dementia[13].

Statistical Parametric Mapping (SPM) analysis of a patient with frontotemporal degeneration and a clinical history of antisocial disorder documented a significant decrease in cerebral blood flow in the orbitofrontal cortex ($p<0.005$) – specifically, in the inferior frontal gyrus, anterior cingulate gyrus, caudate nucleus and insula, compared with the control group.

Mention should be made of the odds ratios (ORs) obtained from the different studies on personality disorders. The value recorded from the data supplied by the publications (OR=13) is clearly superior to 1, thus indicating that individuals with Cluster B personality disorder – specifically borderline personality disorder and narcissistic personality disorder – are at greater risk of suffering dementia or alterations of the abovementioned brain structures. This high odds ratio could be explained by the fact that the affected patient sample was small compared with the global population. The value obtained therefore should be regarded as orientative, and further studies are needed in order to obtain firmer evidence.

DISCUSSION

The results of the present study indicate that individuals with personality disorder, specifically borderline and narcissistic personality disorder, show an increased incidence of structural alterations of the brain – thus possibly increasing the risk of future dementia. Additional risk factors such as depression, smoking, lifestyle, diabetes, etc., would also play a contributing role. Nevertheless, further studies are needed to confirm that personality disorder constitutes a risk factor for the development of dementia. In this regard, there are observable personality changes (apathy, rigidity, egocentrism and altered emotional control) that can manifest in the early phases of the disease and which precede measurable cognitive impairment[19].

Specifically, it has been observed that patients with borderline personality disorder present low N-acetyl aspartate (NAA) levels. Such low concentrations have been related to decreased neuron density, though the literature to date has been unable to confirm whether this deficiency results in cognitive impairment similar to that seen in dementia[9]. Furthermore, neuroimaging techniques have shown these patients to suffer atrophy of the orbital prefrontal cortex, anterior and posterior cingulate cortex, amygdala and hippocampus, in addition to temporal hypometabolism, diminished gray matter in the median and anterior cingulate cortex, and alterations of the serotonin system. It should be noted that these brain structures are also altered in the con-

text of dementia, particularly frontotemporal dementia or Pick disease – thus indicating a close relationship between both conditions. Some patients that develop dementia of this kind have a history of borderline personality disorder[6].

As has been mentioned, borderline and narcissistic personality disorder appear to be the Cluster B personality disorders most closely related to the development of dementia[6]. Nevertheless, despite the limited information available, antisocial personality disorder merits further investigation, since the altered cerebral blood flow seen in such individuals is also very common in dementia. Specifically, alterations of orbitofrontal blood flow can be identified in frontotemporal dementia.

One of the publications involving multiple cases postulated that patients with antisocial personality disorder have diminished blood flow compared with the controls as a consequence of orbitofrontal damage, and a positive correlation has moreover been reported between diminished cerebral blood flow and the possibility of developing dementia later in time[13]. It seems that deterioration of the orbitofrontal cortex may be related to the antisocial behavior seen in patients with frontotemporal dementia.

Furthermore, since individuals with personality disorders such as borderline, narcissistic or antisocial personality disorder present structural alterations of the dorsolateral prefrontal cortex, middle cingulate cortex, pre- and post-central circumvolution and middle and upper frontal circumvolution, they could also be more susceptible to the development of neurodegenerative disorders such as dementia in old age[14].

In addition to investigating the relationship between personality disorder and dementia, we also must consider the literature sources on premorbid and dementia personality traits, since these were the first published studies on the subject. In this regard, there have been reports of a positive correlation among negative emotionality disorder, aggressivity and psychoticism; a negative correlation between agreeableness and conscientiousness; and an inconsistent correlation between introversion and low positive emotionality. It has been described that a narcissistic personality could constitute a risk factor for dementia[14]. This is consistent with the Big Five described by Costa and McCrae[2], i.e., the existence of Cluster B personality disorders or premorbid personality traits (high scores referred to Neuroticism [N] and low scores for Openness [O], Extraversion [E], Agreeableness [A] and Conscientiousness [C]) could be associated to the possible appearance of dementia in old age. Although it is currently not possible to confirm personality disorder as a risk factor for dementia, it is important to take the relationship between both conditions into account. On the other hand, a lesser dementia risk has been described in people with low neuroticism in combination with high extraversion[3]. Furthermore, low neuroticism has been associated to a significantly lesser risk of dementia among inactive or socially isolated individuals. These observations offer evidence that certain personality traits could play an important role in the development of dementia, and that personality and lifestyle interactions may be particularly significant in determining the risk of dementia.

In conclusion, dementia is currently a very common disorder, with a strong negative impact upon both the patients and their families. In this regard, because of the high prevalence of the disease, it is essential to know the associated risk factors in order to try to reduce or attenuate its impact and frequency. A number of risk factors have been investigated, such as depression, lifestyle, smoking, diabetes, etc. However, despite the relationship between personality and health, the available literature on the association between personality disorders and dementia is limited. We therefore conducted the present systematic review and meta-analysis with the aim of exploring personality disorder as a possible risk factor for the development of dementia.

Considering the reviewed publications, mention must be made of some of the identified limitations. On one hand, the existing literature does not offer enough information to either support or reject our starting hypothesis that personality disorder intrinsically constitutes a risk factor for dementia. On the other hand, there is a clear need for studies more specifically dedicated to dementia, since most of the existing publications focus on describing the different cerebral alterations that can be evidenced by using neuroimaging techniques. Thus, in order to either support or reject our starting hypothesis, we require cross-sectional studies using measuring instruments with a view to establishing whether or not there is a correlation between personality disorder and dementia. In turn, longitudinal studies involving controls and experimental subjects with personality disorder would be desirable in order to determine whether the prevalence of dementia is higher in one group or the other.

As commented above, the recorded odds ratio (OR=13) was very high, and could be explained by the fact that the affected patient sample was small compared with the global population. A larger sample very likely would have modified the final result.

Another issue is the fact that most of the studies only specified how many patients with personality disorder were subsequently diagnosed with dementia, without clarifying the number of individuals who ultimately did not develop

dementia. This lack of information makes it difficult to draw precise conclusions.

With regard to the strong points of the reviewed publications, mention must be made of the important contributions made by the neuroimaging techniques, magnetic resonance imaging (MRI) and positron emission tomography (PET), since they have made it possible to identify anatomical and functional substrates characterizing both normal aging and advanced dementia syndrome – thereby paving the way for the development of new treatment options. As an example, PET studies have identified temporal, temporoparietal and frontal hypometabolism both in patients with personality disorder and in subjects with dementia. In turn, MRI has found patients with Cluster B personality disorders to develop alterations of the prefrontal, temporal and/or parietal cortex, as well as alterations in N-acetyl aspartate (NAA) concentration and gray matter – such anomalies also being implicated in dementia.

These imaging techniques are therefore useful not only for detecting cerebral atrophy and degeneration in the elderly but can also be used for example to determine whether an individual with personality disorder suffers any of the aforementioned cerebral alterations.

Patients with a clinical history of borderline or narcissistic personality disorder appear to suffer more alterations of these brain structures, and this in turn could increase the risk of developing dementia in future. Thus, in addition to defining which alterations are found in Cluster B personality disorders, it has been possible to identify those concrete personality disorders most often characterized by brain disorders that are also found in dementia.

The present study suggests that personality can influence the risk of developing dementia; these findings therefore have important implications for public health and clinical practice.

Lastly, it would be strongly advisable to conduct new longitudinal and/or cross-sectional studies on an a posterior basis, as this would allow us to either confirm or reject the initial working hypothesis that personality disorder intrinsically constitutes a risk factor for dementia. If such studies prove able to confirm that the existence of a Cluster B personality disorder constitutes a risk factor for dementia, along with other risk factors investigated to date, it may become possible to reduce or attenuate the impact and frequency of the disease. Further research is therefore crucial for reducing the prevalence of dementia.

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