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## Research report

# Different biogenetic causal explanations and attitudes towards persons with major depression, schizophrenia and alcohol dependence: Is the concept of a chemical imbalance beneficial?

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## ABSTRACT

**Objective:** It is unclear whether different biogenetic causal beliefs affect stigmatization of mentally-ill patients differently. It has been argued that in particular believing in a 'chemical imbalance' as a cause of mental disorder might be associated with more tolerant attitudes.

**Method:** In a representative population survey in Germany ( $n=3642$ ), using unlabelled case vignettes of persons with depression, schizophrenia, or alcohol dependence, we elicited agreement with three different biogenetic explanations of the illness: 'Chemical imbalance of the brain', 'brain disease' and 'heredity'. We further investigated emotional reactions as well as the desire for social distance. For each vignette condition we calculated linear regressions with each biogenetic explanation as independent and emotional reactions as well as social distance as dependent variable controlling for socio-demographic variables.

**Limitations:** Our cross-sectional study does not allow statements regarding causality and the explanatory power of our statistical models was low.

**Results:** 'Chemical imbalance of the brain' and 'brain disease' were both associated with a stronger desire for social distance in schizophrenia and depression, and with more social acceptance in alcohol dependence, whereas 'heredity' was not significantly associated with social distance in any of the investigated illnesses. All three biogenetic causal beliefs were associated with more fear in all three illnesses.

**Conclusion:** Our study corroborates findings that biogenetic explanations have different effects in different disorders, and seem to be harmful in depression and schizophrenia. A particular de-stigmatizing potential of the causal belief 'chemical imbalance' could not be found. Implications for useful anti-stigma messages are discussed.

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## 1. Introduction

Public acceptance of biogenetic causal models of mental disorders is rising (Schomerus et al., 2012), but population studies of attitudes towards persons with mental disorders have triggered a debate whether this development is beneficial or harmful for persons with mental illness. A recent meta-analysis of attitudes related to depression and schizophrenia found that despite a growing biologic public understanding of both, disorders and an improved acceptance of psychiatric professional treatment, the

social rejection of persons with depression remained disturbingly stable over the last 20 years, while acceptance of persons with schizophrenia even declined (Schomerus et al., 2012). There is growing evidence that biogenetic causal beliefs have harmful effects particularly with regard to schizophrenia, but also to depression (e.g. Corrigan and Watson, 2004; Dietrich et al., 2004; Read et al., 2006; Rüsche et al., 2010; Angermeyer et al., 2011; Kvaale et al., 2013; Schomerus et al., 2013a). However, 'biogenetic explanations' is a broadly defined term which encompasses different causal explanations like 'chemical imbalance of the brain', 'brain disease' or 'heredity', which all could have different implications for the stigma of mental illness.

The concept of a 'chemical imbalance of the brain' as a cause for mental illnesses like depression has been developed nearly five decades ago (Schildkraut, 1965) and represents a specific part of the

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biomedical model of mental disorder. A beneficial or harmful effect of this causal explanation on stigma merits further investigation, since it has been argued that, in contrast to *'brain disease'*, the causal belief of a *'chemical imbalance in the brain'* could be beneficial due to connotations of treatability, behavior control or lower persistence of the disease (Griffiths and Christensen, 2004). Although there has been a strident debate about the level of evidence supporting this concept (Kirsch, 2009; Whitaker, 2010), it is frequently used by patient advocacy groups and anti-stigma organizations, particularly when referring to depression (Stiftung Deutsche Depressionshilfe, 2012; National Alliance on Mental Illness, 2012; DBSA, 2009), and is widely spread by popular media (Leo and Lacasse, 2008). *'Brain disease'*, in contrast, is a much more broadly conceptualized term implying a medical illness comparable to other common somatic malfunctions of human organs. It has often been used in studies inquiring the popularity of biogenetic causal beliefs in attitude research (Angermeyer et al., 2011) as well as by patient advocacy groups (Thompson, 2010). There is evidence suggesting similarly negative associations of *'chemical imbalance'* and *'brain disease'* with stigmatizing attitudes (Kvaale et al., 2013). To further clarify this issue we examined these biological explanations in parallel. The causal belief *'heredity'* finally is often perceived as the predominant connotation among the concept of *'biogenetic explanations'*. Investigating the genetic background of various mental disorders is a major focus of current research (International Schizophrenia Consortium et al., 2009). Consequently it has been argued that growing evidence and education could improve tolerance towards affected persons through reducing attributions of guilt and responsibility (Weiner et al., 1988; Weiner, 1995) as well as through enhancing the belief in possible effective treatments, a concept termed *'genetic optimism'* (Conrad, 2001). Contrarily, the concept of *'genetic essentialism'* (Nelkin and Lindee, 2004; Dar-Nimrod and Heine, 2011) linked the causal explanation *'heredity'* to an immutable, determined and naturalistic perception of affected persons, possibly widening a perceived gap between *'us'* and *'them'* by emphasizing connotations of differentness, severity and persistency (Phelan, 2005; Phelan et al., 2006) as well as dangerousness due to a lack of self-control (Dietrich et al., 2006; Schomerus et al., 2013a).

The different implications of the three different biological causal explanations of mental disorders make it likely that they are associated differently with attitudes among the general public. This study is the first examining all three biological causal explanations in parallel, disentangling their potentially differential role for emotions like fear, anger and pro-social reactions and for the desire for social distance from persons with depression, schizophrenia and alcohol dependence.

## 2. Methods

### 2.1. Sampling

2011, a representative population survey in Germany among adult persons (> 18 years, German-speaking) living in private households was conducted using a three-stage random sampling procedure. Altogether, 3642 persons completed the interview, reflecting a response rate of 64.0%. [Supplementary Table 1](#) shows socio-demographic characteristics of our sample which can be considered as largely representative of the German population. The study had been approved by the ethics committee of Greifswald University.

### 2.2. Interview and case-vignettes

Personal, fully structured interviews were conducted face-to-face. The interview started with presenting an unlabelled case-vignette of

a person with schizophrenia, depression or alcohol dependence. The wording of the vignettes has been published earlier (Schomerus et al., 2013a) and was constructed to be consistent with the diagnostic criteria of the respective disorders in DSM-IV.

### 2.3. Measures

#### 2.3.1. Causal beliefs

We elicited beliefs about possible causes of the problem described in the vignette with a list of ten possible causes in total, each of which had to be rated on a five point Likert scale anchored with 1 = 'certainly a cause' and 5 = 'certainly not a cause'. Three causal beliefs were related to the factor *'biogenetic causes'* comprising the items *'chemical imbalance in the brain'*, *'brain disease'* and *'heredity'*. These items are analyzed separately. For linear regression analysis we reversed the item scores, with higher scores indicating higher agreement with the appropriate causes.

#### 2.3.2. Emotional reactions

We presented respondents with a scale consisting of 10 items describing possible emotional reactions, asking them to indicate how they would react to the person described in the vignette. Answers were given on five-point Likert-scales anchored with 1 = 'applies completely' and 5 = 'does not apply at all'. For linear regression analysis we reversed the item scores, with higher scores indicating stronger emotional reactions. An exploratory principal-component factor analysis with varimax rotation resulted in three factors named *'fear'*, *'anger'* and *'pro-social reactions'* (for details, see Schomerus et al. 2013b). We used factor scores of the three factors (mean 0, standard deviation 1).

*The desire for social distance* is a widely used measure of individual discrimination and thus represents the final stage of the stigma process (Link and Phelan, 2001; Link et al., 2004). Respondents were asked how willing they would be to accept the person described in the vignette in various social relationships, using the social distance scale developed by Link et al. (1987). We used a sum-score of all seven items for our analyses, higher scores indicating greater social distance towards the described person.

### 2.4. Statistical analysis

For each of the three vignette conditions, we performed four linear regression analyses, using social distance and the factor scores *'fear'*, *'anger'*, and *'pro-social reactions'* as dependent variables and the three biogenetic causal explanations as independent variables, controlling for age, gender and education and using the unweighted survey data. We report unstandardized (B) and standardized (Beta) coefficients for each analysis.

A more detailed description on the methodsection is available in the supplementary data.

## 3. Results

[Table 1](#) shows the correlation coefficients of the three biogenetic causal beliefs grouped by illness and calculated as Pearson's *r*. The causal belief *'brain disease'* and the causal belief *'chemical imbalance'* correlated stronger in all three investigated mental illnesses (0.63–0.66; all  $p < 0.001$ ) than any correlation between these two with the causal belief *'heredity'* (0.39–0.54; all  $p < 0.001$ ).

[Table 2](#) shows results of our regression analysis relating different attitudes to causal beliefs. All three biogenetic causal beliefs were associated with more fear in schizophrenia, depression and alcohol dependence, this effect being smallest for *'heredity'*. In depression and alcohol dependence all three biogenetic explanations were

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