Psychiatry Research 260 (2018) 24–29

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Associations between causal attributions and personal stigmatizing attitudes in untreated persons with current mental health problems

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ARTICLE INFO

Keywords:
Stigma of mental illness
Causal attributions
Depression

ABSTRACT

Past research has shown that among the general public, certain causal explanations like biomedical causes are associated with stronger desire for social distance from persons with mental illness. Aim of this study was to find out how different causal attributions of persons with untreated mental health problems regarding their own complaints are associated with stigmatizing attitudes, anticipated self-stigma when seeking help and perceived stigma-stress. Altogether, 207 untreated persons with a current depressive syndrome were interviewed. Biomedical causes, but also belief in childhood trauma or unhealthy behavior as a cause of the problem, were associated with stronger personal stigma and with more stigma-stress. Similarities and differences to findings among the general population and implications for future research are discussed.

1. Introduction

Since the 1990s, causal attributions of mental illness have been discussed in conjunction with stigmatizing attitudes. In particular, biomedical causal explanations have received much attention, at first because they were thought to reduce the stigma of mental illness in the context of attribution theory, but then increasingly because of their potential to increase stigma, a relation that has been conceptualized within the framework of genetic essentialism (Phelan, 2005; Rüsch et al., 2010; Schomerus et al., 2014). Several studies among the general public demonstrated that biological causal explanations are associated with stronger desire for social distance towards persons with mental illness (Angermeyer et al., 2011). In the view of genetic essentialism one explanation for this finding is that biomedical or genetical causal explanations for mental illness are associated with less self-control as well as less chances of recovery and thus with notions of 'being different' and 'dangerous' (Kvaale et al., 2013; Phelan, 2005; Rüsch et al., 2010; Schomerus et al., 2014). While psychosocial explanations like current stress seem to be associated with more positive attitudes at least towards a person with schizophrenia (Schomerus et al., 2014), this does not seem to hold true for all psychosocial causal explanations and all types of mental illness. Somewhat unexpectedly, a representative population survey in Germany investigating both psychosocial causal explanations and biological causes found that particularly in depression, the causal explanation of childhood adversities was associated with stronger rejection of an affected person (Schomerus et al., 2014). The stigmatizing potential of attributing mental illness to childhood adversities is a new finding which warrants further exploration (Schomerus, 2012). Many previous studies examined attitudes of the general population using case vignettes (typically depression or schizophrenia or mental illness in general) or the label of a mental illness (e.g. Angermeyer et al., 2014; Jorm and Griffiths, 2008; Read et al., 2006; Rüsch et al., 2010), thus exploring the respondents' causal explanations for another person's mental health problem.

Our aim in this study is to find out how different causal explanations of persons with untreated mental health problems – individuals we know very little about (Stolzenburg et al., 2017) – regarding their personal complaints are associated with personal stigmatizing attitudes, anticipated self-stigma and stigma-stress. Attitudes of untreated persons with mental health problems are particularly relevant, since both causal attributions and personal stigma likely interfere with different stages in process of help-seeking (Clement et al., 2015; Speerforck et al., 2016; Stolzenburg et al., 2017; Wrigley et al., 2005). Moreover, causal explanations that increase stigma might add to the burden of mental illness because more self-stigmatization and higher perceived stigma-stress have been shown to be associated for instance with reduced well-being, self-esteem, more suicidal ideation, delays in treatment seeking and participation in mental health care (Corrigan et al., 2014; Oexle et al., 2016; Rüsch et al., 2014a, 2014b). Knowledge about the stigma correlates of lay illness beliefs is necessary for developing helpful

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https://doi.org/10.1016/j.psychres.2017.11.014
Received 6 June 2017; Received in revised form 27 September 2017; Accepted 3 November 2017
Available online 06 November 2017
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interventions for reducing stigmatizing attitudes and increasing readiness to seek help for mental health problems. Such interventions rely on research which is able to make suggestions what type of illness beliefs or picture of mental health problems leads to more readiness to seek help and less stigmatizing attitudes. Based on previous studies we hypothesize that both biological causal explanations and attribution to childhood adversities are associated with stronger stigmatizing attitudes.

2. Methods

2.1. Sample and study design

We invited persons with a depressive syndrome via newspaper advertisements, Facebook posts and flyers to participate in our study. We focused our adverts on symptoms of depression because it is one of the most common mental disorders in the general population (Alonso et al., 2004). Altogether, 429 persons contacted the study center and underwent telephone screening using the PHQ-9 (Patient Health Questionnaire – Depression). Persons scoring > = 8 and reporting that they currently did not receive any professional treatment for their complaints were invited for a personal interview (n = 266). In sum, 233 persons attended and completed the interview. The study was approved by the local ethics committee. Personal interviews were conducted by three psychologists with clinical experience.

For our final analyses, n = 22 participants were excluded because at the time of the interview, they did not fulfill criteria for a mental disorder according to ICD-10 as established in a structured diagnostic interview. Four participants were excluded because they stated that they were presently receiving treatment for their problem. Our final sample thus consists of n = 207 participants with a currently untreated mental health problem, fulfilling ICD-10 criteria for a mental illness. About half of the sample (53.2%) had been previously in treatment for a mental health problem.

2.2. Measurements

The interview consisted of a self-report questionnaire and a diagnostic interview. At the beginning, socio-demographic variables were assessed (gender, age, education, employment, previous treatment).

2.2.1. Causal explanations

To find out whether and to what extent participants attributed their symptoms to different causes, we used a 25-item list of causal explanations compiled from the illness perception questionnaire (IPQ-R; Moss-Morris et al., 2002) and from population surveys on mental disorders in Germany (e.g. Schomerus et al., 2006). Participants rated each item on a 5-point Likert scale anchored with “don't agree at all” – 1 and “agree completely” – 5. We conducted an explorative factor analysis, details of which are published elsewhere (Stolzenburg et al., under review). In brief, factor analysis with varimax rotation resulted, after scree plot examination, in five uncorrelated factors with an Eigenvalue > 1. We termed the first factor *‘biomedical causes’* (Eigenvalue 5.16) containing items like ‘bacteria or viruses’ (factor loading, .82), ‘chemical imbalance in the brain’ (.77), ‘brain disease’ (.58); the second factor comprised *‘person-related causes’* (Eigenvalue 2.50), containing items like: my attitudes (.75), weakness of will (.72), my personality (.70); we termed the third factor *‘childhood trauma’* (Eigenvalue 1.67), containing items like: ‘growing up in broken families or in an orphanage’ (.79), ‘sexual or physical abuse during childhood or adolescence’ (.75),’ unloving or too strict upbringing’ (.71); we termed the fourth factor *‘stress’* (Eigenvalue 1.35), containing items like: ‘stress and worries’ (.80), ‘family problems’ (.77), ‘my emotional well-being’ (.62); and we termed the fifth factor *‘unhealthy behavior’* (Eigenvalue 1.20), containing the items: ‘alcohol use’ (.80) and ‘smoking behavior’ (.76). Of note, the item “dietary habits” most strongly loaded on factor 1 (‘biomedical causes’, .57) and not on ‘unhealthy behavior’, which might point towards a stronger moral connotation of the latter factor (for all items and factor loadings see online Supplement Table 3). For the final analyses we used factor scores for each participant.

Stigma-related questionnaires were:

2.2.2. Social distance

The social distance scale is an established scale of seven items that assesses respondent´s willingness to interact with persons with mental illness in various hypothetical everyday situations like working together or renting a room (Link et al., 1987). The scale was used to assess the extent of personal stigmatizing attitudes. Items are rated on a 5-point Likert scale with “very likely” – 1 to “very unlikely” – 5 (Cronbach's α = .85). On average, participants had a total score of M = 11.5 (SD = 3.9, range 5–25) and an item-level mean of 2.3 (SD = .8).

2.2.3. Agreeing to stereotypes

We used the ‘agree’ subscale (10 items) from the Self-Stigma of Mental Illness scale (SSMI; Corrigan et al., 2006) to assess agreement with negative stereotypes (Cronbach's α = .82). Items are rated on a 5-point Likert scale anchored with “don´t agree at all" -1 and "agree completely" -5”. On average, participants had a total score of M = 19.3 (SD = 5.7, range 10–35) and an item-level mean of 1.9 (SD = .6).

2.2.4. Support for structural discrimination

Additionally, we used three items to assess approval of structural discrimination of persons with mental illness. Structural discrimination refers to rules, procedures and laws that work to the disadvantage of a stigmatized group (Schomerus et al., 2007). Items (“If persons with mental illness do not consent to medical treatment, they should receive compulsory treatment”, “Persons with mental illness should not be allowed to have a driving license”, “Persons with mental illness should not be allowed to hold public office”) were rated on a 5-point Likert scale anchored with “don't agree at all” – 1 and “agree completely” – 5 (Cronbach's α = .70). On average, participants had a total score of M = 7.1 (SD = 3.0, range 3–15) and an item-level mean of 2.4 (SD = 1.0).

2.2.5. Perceived stigma-stress

We used the Stigma-Stress-Coping Scale (Rüsch et al., 2009) to elicit anticipated stigma (by others) as a stressor when becoming mentally ill. Four items of this eight-item scale assess the appraisal of stigma as harmful, and four items assess perceived resources to cope with stigma. By subtracting perceived coping resources from perceived harmfulness we computed a stress appraisal score (Rüsch et al., 2014b). Items were rated on a 5-point Likert scale anchored with “don't agree at all” – 1 and “agree completely” – 5 (Cronbach's α = .78). On average, participants had a stress appraisal score of M = − 6.0 (SD = 5.4, range − 16 – 11) and an item-level mean of 2.0 (SD = .9) for subscale perceived stress and 2.5 (SD = .8) for subscale perceived coping resources.

2.2.6. Self-stigma of seeking help

The self-stigma of seeking help scale (SSOSH) assesses the anticipated loss of self-esteem a person would feel if they would seek help from a mental health professional (Vogel et al., 2013). We validated the German translation of this established scale (available at https://selfstigma.psych.iastate.edu/ssosh-scale/) by doing an independent back translation (which did not yield any discrepancies) and then adapted it for our purpose by replacing the term “psychological help” with “professional help” to cover the full range of professional help available for mental health problems. Participants rated each item on a 5-point Likert scale anchored with “don't agree at all” – 1 and “agree completely” – 5 (Cronbach's α = .84). On average, participants had a total score of M = 22.6 (SD = 7.3, range 10–47) and an item-level mean of 2.3 (SD = .7).

We additionally assessed the following questionnaires:

2.2.7. Depression knowledge

To include the extent of knowledge about symptoms of depression in our analysis we used the German version of the Depression Literacy Scale (D-Lit; Griffiths et al., 2004). D-Lit consisted of 22 true/false items on typical and atypical symptoms of depression, but does not include items on potential causes of the illness (Cronbach's $\alpha = .74$). On average, participants had a total score of $M = 11.5$ ($SD = 3.7$, range 1–20).

2.2.8. Current depressive symptoms

We used the PHQ-9 as a measure of current depression severity (Cronbach's $\alpha = .78$). On average participants had a PHQ-9 sum score of $M = 12.9$ ($SD = 4.7$, range 3–27), which corresponds to a moderate depression (Kroenke et al., 2001).

2.2.9. Experienced childhood adversities

We used the Childhood Trauma Screener (Grabe et al., 2012) to assess traumatic experiences in childhood. The scale consists of five items, each representing one subscale (emotional abuse, physical abuse, sexual abuse, physical neglect and emotional neglect) of Childhood Trauma Questionnaire (CTQ; Bernstein and Fink, 1998). All items are rated on a 5-point Likert scale ("never" – 1, "rarely" – 2, "sometimes" – 3, "often" – 4, "very often" – 5). On average participants had a CTS sum score of $M = 9.3$ ($SD = 3.8$, range 5–25) and an item-level mean of 1.9 ($SD = .8$).

2.2.10. Diagnostic interview

To establish whether participants had a mental illness requiring treatment we conducted a short structured diagnostic interview – the German version of the Mini International Neuropsychiatric Interview (M.I.N.I.; Ackenheil et al., 1999) assessing psychiatric Axis-I-Disorders from DSM-IV and ICD-10.

2.3. Statistical analyses

We first used bivariate correlation analysis to assess the relation between causal explanations, stigma variables, depression knowledge, previous treatment, current depressive symptoms and socio-demographics. We then performed multiple regression analyses, using the stigma variables as dependent and the five causal explanations as independent variables, controlling for depression knowledge (D-Lit), previous treatment, current depressive symptoms (PHQ-9), age, gender and education as potential confounders of any association between causal beliefs and stigma. All regression analyses report standardized beta-coefficients and were computed using STATA (version 14).

3. Results

3.1. Sample characteristics

In terms of socio-demographics (see Table 1) participants were on average 49.6 years old ($SD = 16.3$), 71.0% were female. The sample included people of all ages (range 18–80 years). Most participants fulfilled criteria of an affective disorder (82.3%) or anxiety disorder (57.4%) according to ICD-10. Attributing personal mental health problems to childhood trauma was strongly correlated to reporting childhood trauma in the brief childhood trauma screener ($r(183) = .69$, $p < .001$).

Table 2 displays bivariate correlation coefficients between control variables (depression knowledge, previous treatment, current depression symptoms, age, gender and education), causal explanations and stigma variables. The strongest associations were: (a) depression knowledge and lower stigma (social distance and support for structural discrimination), (b) previous treatment and stronger belief in childhood trauma as a cause, as well as (c) current depressive symptoms and stronger belief in person-related causes and stress as a cause for the present mental health problems.

Table 1
Characteristics of sample ($n = 209$).

	N	%
Gender		
Female	147	71.0
Male	60	29.0
Age		
18–24	21	10.6
25–34	30	14.5
35–44	15	7.3
45–54	47	22.7
55–64	58	28.0
> 65	36	16.9
Education in school years*		
12 or 13 years	74	35.9
10 years	114	55.1
9 years or less	14	6.8
Family status*		
Married	76	36.7
Divorced	44	21.3
Single	78	37.7
Employment*		
Unemployed	24	11.9
Employed	79	38.2
Pension/unable to work	12	6.0
Retired	50	24.9

Note. N = Number of Participants, % = Percent, *Total numbers of cases $n < 209$ due to non-response.

3.2. Associations between causal explanations and stigmatizing attitudes

Fig. 1 visualizes the results of our multiple regression analyses, relating causal beliefs to stigma variables. Attributing personal current mental health problems to biomedical causes was associated with stronger desire for social distance. Attributing present complaints to childhood trauma was related to stronger desire for social distance, to more perceived stigma-stress, and (just below significance) to stronger self-stigma when seeking help ($p = .055$). The causal explanation 'unhealthy behavior' was related to stronger support for structural discrimination. We performed stepwise multiple regression analyses with two models (model 1, only control variables as predictors; model 2, control variables and all five factors of causal explanations), comparing adjusted R-squares of the two models for each regression analyses. The model including causal explanations explained a larger amount of variance of social distance (adjusted R2, .12 versus .06) and perceived stigma stress (adj. R2, .08 versus .02), while it showed only little improvement explaining stereotype agreement (adj. R2, .03 versus .02), support of discrimination (adj. R2, .12 versus .11) and self-stigma when seeking help (adj. R2, .07 versus .05).

Within the multiple regression models, higher depression knowledge was associated with lower stigma (social distance, agreeing to stereotypes, support for structural discrimination and anticipated self-stigma when seeking help, $\beta = -.19$ to $-.28$, $p = .001$–$.034$). Being previously in treatment was associated with lower self-stigma when seeking help ($\beta = -.19$, $p = .018$). Current depressive symptoms were associated with less desire for social distance ($\beta = -.17$, $p = .047$). Higher age was related to less anticipated self-stigma when seeking help ($\beta = -.19$, $p = .027$) and more support for structural discrimination ($\beta = .17$, $p = .044$).

4. Discussion

This is the first study investigating the associations between causal explanations of own mental health symptoms and stigma in untreated individuals with current mental health problems. Our results confirm previous results from studies among the general population: Biological

Table 2
Bivariate correlation coefficients of variables depression knowledge, previous treatment, current depression symptoms, age, gender and education with causal explanations and stigma variables (n = 186–207).

	Depression knowledge	Previous treatment	Depression symptoms	Age	Gender	Education
Causal explanations						
Biomedical causes	− .10	.11	.16*	.10	.00	− .04
Person-related causes	.13	.14	.33***	− .19**	− .00	.16*
Childhood trauma	.22**	.29***	.20*	− .03	.15*	− .02
Stress	.21**	.11	.32***	− .10	.18*	.09
Unhealthy behavior	− .01	− .07	.13	− .22**	− .03	.06
Stigma variables						
Social distance	− .28***	− .08	− .14*	.12	− .12	− .07
Agreeing to stereotypes	− .20*	− .06	.07	.03	− .10	− .04
Support for structural discrimination	− .31***	− .15*	− .06	.19**	− .14*	− .09
Stigma-stress	.03	.08	.19**	− .12	− .05	.06
Self-stigma when seeking help	− .05	− .14*	.10	− .19**	.02	.09

Note. Previous Treatment (1 = Yes); Gender (1 = Woman).
* $p < .05$.
** $p < .01$.
*** $p < .001$.

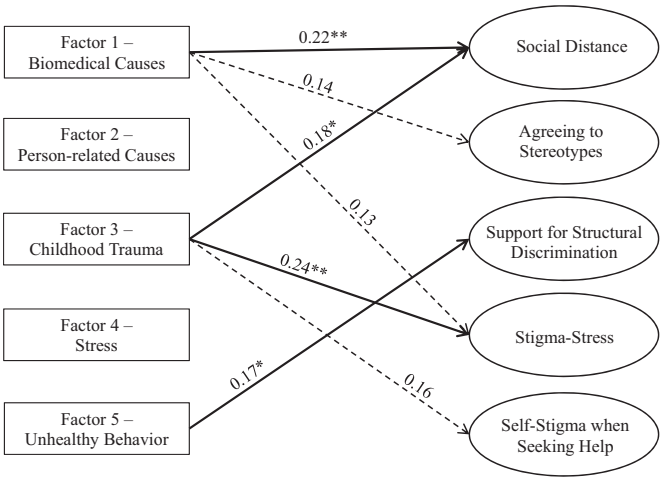

Fig. 1. Standardized Beta-coefficients of multiple regression analyses of causal explanations (factor 1–5) predicting stigmatizing attitudes (social distance, agreeing to stereotypes, supporting structural discrimination, stigma-stress, self-stigma when seeking help). Each regression analysis was controlled for depression knowledge, previous treatment, current depression symptoms, age, gender and education (n = 176–178). Adjusted R^2 = .03–.12. Dotted line = $p < .10$; * $p < .05$, ** $p < .01$, *** $p < .001$.

causal attributions are associated with more social distance, and attributing personal mental health problems to childhood trauma is also associated with more desire for social distance as well as with more perceived stigma-stress. Additionally, attributing current mental health problems to unhealthy behavior was associated with stronger support for structural discrimination.

Before discussing our findings, some limitations of our study should be mentioned. First, we used a convenience sample of untreated people with a depressive syndrome that cannot be regarded representative for all persons with untreated mental health disorders. Second, our findings are correlational based on a cross-sectional study and cannot prove causal relations. Third, our models did explain only a small amount of variance of our stigma measures, and coefficients. This is in line with previous studies among the general population relating causal beliefs to stigma measures (e.g. Dietrich et al., 2004; Schomerus et al., 2014), indicating that other factors apart from causal explanations likely also impact on stigma.

Other studies found biogenetic beliefs among affected individuals being associated with more pessimism about recovery and less likelihood to see value in psychological interventions (Haslam and Kvaale, 2015). Furthermore, Lebowitz and Ahn (2014) reported that biological causal explanations significantly reduced clinician's empathy towards individuals with mental illness. The association between biological causal attributions and more social distance in untreated persons with need for treatment is in line with other study results in the general population (Angermeyer et al., 2011; Speerforck et al., 2014) or in individuals with mental illness with contact to mental health care (Rüsch et al., 2010). However, given the small amount of variance explained by our models, is also conceivable that the link between causal explanations and stigma becomes more relevant for individuals being in contact with mental health services. This would correspond to the findings of Rüsch et al. (2010), who found the association between implicit and explicit stigmatizing attitudes and biogenetic causal attributions being considerably stronger in persons with longstanding severe mental illness compared to members of the general public. The associations shown in our study could thus become more salient and relevant to persons who actually undergo treatment.

Previous research has shown that biogenetic causal explanations evoke notions of fundamental differentness and lead to perceiving persons with mental health problems as 'neurobiological others' and almost a 'different species' and therefor are associated with stronger desire for social distance (e.g. Kvaale et al., 2013; Schomerus et al., 2014), which could have relevant negative consequences for affected persons. Our results confirm this hypothesis that has been referred to as "genetic essentialism", but has been proved for various biological causal explanations (Speerforck et al., 2014). While biological causal explanations can lead to reduced blame, they have been shown to be associated with prognostic pessimism about recovery (Haslam and Kvaale, 2015), which could conceivably affect treatment outcome or compliance. Additionally genetic causal attributions, which were included in our biomedical term, could be "seen as a fundamental and perhaps immutable, identity-defining trait" (p. 331; Rüsch et al., 2010) in affected persons, potentially having an important influence on negative self-perceptions and lower self-efficacy expectations.

Our study also extends findings from a general population study, linking belief in childhood trauma as a cause of depression to more stigmatizing attitudes (Schomerus et al., 2014). The study used an entirely different sample and design, examining the general public with the help of case vignettes. At this stage, we can only speculate why persons who attribute their mental health problems to childhood trauma have less tolerant attitudes towards other persons with mental health problems and experience more stigma stress. A study among persons with schizophrenia found that report of childhood sexual abuse was associated with stronger endorsement of negative stereotypes about persons with mental illness, but also with more discrimination experience, social withdrawal and alienation (Outcalt and Lysaker,

2012). The authors argue that having experienced trauma might lead to increased shame and self-blame, which however does not entirely explain why other persons with mental illness are seen more critical. On a speculative level, it is perceivable that traumatized individuals could be less tolerant towards persons with mental illness because of their biographic experience that humans are able to be violent. This personal experience might make them particularly susceptible to the prevalent public stereotype that persons with mental illness are unpredictable and dangerous (Corrigan et al., 2003). According to the progressive model of self-stigma (Corrigan et al., 2011), this negative evaluation of other persons with mental illness would translate into more self-stigma.

However, the association between attributing depression to childhood adversities and stronger stigmatizing attitudes observed in the general public suggests that this relation is not entirely explained by own experiences of childhood trauma. Childhood trauma likely has persistent negative long-term consequences for the social identity or social functioning of affected people (Cloitre et al., 2005; Turner and Lloyd, 1995). According to Goffman´s definition of stigma as denoting a spoiled identity (Goffman, 1963) having experienced childhood trauma could be seen as a 'blemish of individual character' like mental illness; notwithstanding there is no mental illness. In case of experienced childhood trauma and mental illness affected individuals could be seen as double burdened/stigmatized persons in terms of their mixed 'spoiled identities', which might have particularly severe consequences e. g. for help-seeking, self-esteem or social functioning. There are good reasons to suspect that childhood trauma carries a particular stigma on its own, and future research is needed to characterize and understand this stigma, in order to develop destigmatizing strategies for the general public or for affected untreated and treated individual's. There are existing efforts dealing with double stigma for other groups like individuals with HIV and mental illness or obesity and mental illness. Targeted anti-stigma interventions addressing individuals with childhood trauma and mental illness might help to reduce barriers for seeking help and recovery in this particularly vulnerable group.

Our results did not show any association between attributing personal mental health problems to current stress and less stigma. This contrasts with findings from the general population (Schomerus et al., 2014), suggesting that, while explaining mental illness as the result of current stress might help to destigmatize persons with mental illness in the general population, it seems to have little potential for reducing stigmatizing attitudes in affected persons. Generally, participants in this study showed low stigma when compared with the general population. Respondents for example expressed a low desire for social distance with an average a sum score of 11.5, compared to 15.4 elicited among the general population in Germany with regard to a male person with depression as described in an unlabeled vignette (Angermeyer et al., 2014).

Other findings of our study do well relate to findings in previous studies: More knowledge about depression symptoms and treatment was consistently associated with less stigma, corroborating studies emphasizing the role of depression knowledge for reducing prejudice (Griffiths et al., 2004; Kiropoulos et al., 2011; Thornicroft et al., 2007). Moreover, higher age was associated with less self-stigma when seeking help and more support for structural discriminations. There is evidence for both of these associations: Younger adults have been shown to have stronger critical attitudes about seeking professional help (Corrigan et al., 2014; Mojtabai, 2007) and older adults have been shown to have stronger stigmatizing attitudes (Schomerus et al., 2015). Clement et al. (2015) discussed in their systematic review that younger people may feel stronger dissonance between their preferred social identity and negative stereotypes about mental illness, which results in a stronger relationship between stigma and help-seeking for this group. Thus, anticipated self-stigma when seeking professional help could be particularly high for younger individuals. Our finding about the association of unhealthy behavior and support for discrimination has not been previously reported. One could speculate that people who feel guilty because of alcohol and cigarette consumption project their anger on persons with mental illness, but certainly this association would need to be replicated and explored in more detail before drawing any conclusions.

In summary, our results suggest that etiological beliefs about mental illness are of relevance for the stigma of mental illness, especially for social distance and perceived stigma-stress. Future research is needed to evaluate differences between currently untreated and treated individuals regarding the strength of negatively or positively relations of causal explanations and stigmatizing attitudes. Knowledge about these complex relations is of relevance for the first contact between an affected individual and the mental health service as well as for interventions aiming to reduce the stigma and increase readiness to seek professional help in the general public. Accordingly, when educating persons about the presumed etiology of their mental illness, it would be necessary to consider the stigmatizing potential of any etiological theory, since different explanations are linked to different perceptions of dangerousness, otherness, guilt and recovery. Psychoeducation should not solely be focused on biological explanations of mental illness, but rather highlight biological as well as psychological and social causal explanations as equally important and highly individual. Whereas, the biopsychosocial paradigm has been criticized due to only include psychosocial factors as triggers of the supposed genetic predisposition (Read, 2007). Affected individuals should be asked about their personal causal explanations and stigmatizing attitudes. Anti-stigma interventions should also be aware of the stigmatizing potential of different causal explanations and also use a heterogeneous etiology model for mental illness.

Conflicts of interest

None.

Role of the funding resource

This work was supported by the Deutsche Forschungsgemeinschaft (DFG) (Grant-ID SCHO 1337/4-1 and SCHM 2683/4-1).

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.psychres.2017.11.014.

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