

# Association of stigma resistance with emotion regulation — Functional magnetic resonance imaging and neuropsychological findings

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## Abstract

**Background:** Personal characteristics contribute to whether negative attitudes in society are internalized as deteriorating self-stigma. Studies in healthy subjects suggest that resilience is associated with the regulation of amygdala activation by the medial prefrontal cortex (mPFC), but little is known about the factors that contribute to individual stigma resistance in psychiatric patients.

**Methods:** We assessed stigma (by measuring association strengths between social inferiority and schizophrenia by an implicit association test) in 20 patients with schizophrenia and in 16 age- and sex-matched healthy control subjects. The brain activation strengths were measured by functional magnetic resonance imaging during evaluation of schizophrenia-related statements and of control statements.

**Results:** Association strengths between social inferiority and schizophrenia were inversely related to the strength of the activation of the rostro-ventral mPFC. This inverse correlation survived adjustment for global functioning, depression symptom scores, and insight. Activation of the rostro-ventral mPFC was negatively correlated with activation of the amygdala. The association strengths between social inferiority and schizophrenia correlated with the compromised performance in a Stroop task, which is a measure of cognitive regulation.

**Discussion:** Our findings suggest that individual stigma resistance is associated with emotion regulation. These findings may help to understand better stigma resistance and thereby aid the development of patient interventions that add to the public anti-stigma work in reducing devastating effects of stigma.

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## 1. Introduction

Persons with mental disorders are doubly affected by their condition. First, the symptoms of the illness cause distress and impairment. Second, social misconceptions about mental disorders burden the patient with the stigma of “insanity”. Cultural practices of naming persons with a mental disorder, say schizophrenics, exacerbate the process of stigmatization by separating “us” from “them”. Most of these patients

silently accept the negative culturally held attitudes. Social discrimination and rejection are related to a subjective fear of being stigmatized and also to self-stigmatization. The latter is an acceptance of social negative appraisals as true evaluation of one’s value as a human being [1].

Self-stigmatization leads to the loss of self-esteem [2], a decrease of the quality of life, and to depression [3,4]. Such internalized stigma may be one reason why the reduction of objective symptoms of psychosis is not sufficient in itself in improving the subjective quality of life in people with mental disorders. More fundamentally, the importance of self-stigmatization reflects a pervasive shift of priorities in health systems, health care ethics and even health economics towards outcomes subjectively valued by patients. These subjective outcomes include autonomy, quality of life and patient-reported outcomes in general [5,6].

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Not all people with mental illness are uniformly susceptible to self-stigmatization. Some seem to be able to resist negative attitudes. Such stigma resistance interferes with acquiescence in applying negative attitudes that, in turn, increase the subjective influence of stigma and impairs recovery. Therefore, enhancing stigma resistance could become an important target of treatment interventions. Enhancement of stigma resistance comprises one of the core aspects of recovery-orientation movement: “the development of new meaning and purpose in one’s life, irrespective of the presence or absence of symptoms of mental illness” [7].

Self-stigma has usually been measured by explicit interviews or questionnaires [8]. However, respondents may have varying self-representational strategies or may be unaware of their automatic appraisals [9], and for sensitive issues the explicit scales may be biased towards emotionally neutral answers [10]. Implicit measures may have better predictive validity than explicit measures in sensitive areas such as intergroup or interracial behavior [10,11]. Therefore, researchers have started to use implicit association tests to measure implicit association strengths between mental disorders and stigma [9,12]. Consequently, we measured implicit association strengths between schizophrenia and social inferiority in this study.

Although the neurobiological underpinnings of resilience towards mental disorders have attracted recent interest [13,14], the neurobiology of stigma resistance remains unknown. It is known that in healthy subjects, the function of the medial prefrontal cortex (mPFC) is related to reappraisals and optimism, and that the functioning of that same brain region is attenuated under conditions of anxiety and depression [13]. The rostral-ventral mPFC has been especially associated with emotion regulation [15] and control of the amygdala, which are factors that may play important roles in resilience [13,14]. We therefore hypothesized that the activity of the rostral-ventral mPFC during the processing of one’s illness is associated with a weaker amygdala activation and weaker implicit associations between schizophrenia and social inferiority in subjects with schizophrenia.

## 2. Material and methods

This study combines new implicit measurements of the strengths of the associations between social inferiority and schizophrenia with neuropsychological and functional magnetic imaging (fMRI) data that were collected during the evaluation of statements about one’s illness in our published study [16].

### 2.1. Participants

We recruited patients with schizophrenia from the Helsinki City Health Center, Department of Psychiatry. We excluded those with drug- and alcohol dependency,

neurological traumas, neurological disorders, and MRI contraindications. We also invited healthy age- and sex-matched control subjects from a pool of voluntary subjects attending Aalto University, Espoo, Finland. Twenty three of the 40 invited patients and 17 of the 25 control subjects volunteered. Twenty of the patients were able to participate in functional imaging and implicit association testing. One control subject had excessive (> 1 voxel diameter) head movement during scanning, thus 20 patients and 16 healthy control subjects were included in the final analysis (Table 1).

### 2.2. Clinical and neuropsychological assessment

One of us, T. T. R. used a structured interview for DSM-IV [17] to determine the diagnosis, a positive and negative symptom scale (PANSS) to assess the severity of the schizophrenia symptoms [18], the Calgary Depression Scale to estimate the severity of depression [19], and the Global Assessment Scale (GAS) to evaluate global functioning [20]. Insight was assessed on a composite scale (see: 2.7. Magnetic resonance imaging) that we have previously shown to correlate with other insight measures [16].

T. J. J. R. used Trail Making B [21] and the Stroop Color Word Interference Test [22] to assess executive functions, the Wechsler Adult Intelligence Scale [23] to estimate general intelligence, and the Logical Memory test from the Wechsler Memory Scale [24] to assess memory function.

### 2.3. Assessment of implicit association strengths (IAS) between schizophrenia and social inferiority: IAS-score

The implicit association test (IAT) [25] was conducted during the same day as the fMRI scanning. During the test, patients and healthy control subjects classified category-related words into four categories using a computer. The category-related words appeared one by one in the middle of the screen while the choices of the most appropriate categories were displayed on the left and right sides of the screen. We instructed study participants to classify words by pressing a button at the side of the appropriate selected category as quickly as possible without frequent mistakes. A comparison condition is necessary for IATs, so we used common cold as a stigma-neutral condition during the IAT and during fMRI. The categories (and category-related words) during IAT were: good (loved, valuable, wonderful, clever, skilful and competent), bad (hated, miserable, poor, stupid, useless and vile), schizophrenia (paranoia, psychosis, hallucination, mental disease, memory problem and lethargy), and common cold (cold, fever, cough, sore throat, ache and sneezing).

First, the subject assigned category-related words to two pairs of categories once (either “good” and “bad” one pair or “schizophrenia” and “common cold” second pair). Second, the category words appeared together two on each side (e.g. “good” and “common cold” on the left and “bad” and “schizophrenia” on the right) and the subject assigned words from all four categories to the relevant sides. Third, the word

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