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How continuum beliefs can reduce stigma of schizophrenia: the role of perceived similarities

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1. Introduction

Partitioning the world into understandable distinct categories is a basic human cognitive process (Tenenbaum et al., 2011). In the social world, categorization occurs at the earliest stages of cognitive processing (Ito et al., 2004). However, social categorization, even with mere distinguishing cues, can lead to outgroup stigmatization (Tajfel et al., 1971). In mental illness, reducing stigmatization has received recent though strong interest (Corrigan et al., 2006; Corrigan & Penn, 1999; Morgades-Bamba et al., 2019).

Among mental illnesses, schizophrenia is a social category associated with one of the strongest stigmas (Link & Phelan, 2001), which can be described at two levels: public stigma and self-stigma. Public stigma is the public endorsement of stereotype, prejudice and discrimination toward a minority group, whereas self-stigma is the stereotype, prejudice and discrimination that people with mental illnesses apply to themselves (Corrigan et al., 2005). For Yanos, Roe, Markus, & Lysaker (2008), self-stigma can be referred to as the state in which a person with severe mental illness loses previously held or hoped identities (*i.e.* self as student, self as worker, self as parent, and so on) and adopts stigmatizing views (*i.e.* self as dangerous, self as incompetent, and so on). Both public and self-stigma are barriers to recovery from mental illness (Leamy et al., 2011). Finding methods to reduce stigmatization in the general population (*i.e.* public stigma), as well as in stigmatized persons (*i.e.* self-stigma), is a priority of the WHO European mental health action plan (*The european mental health action plan 2013-2020*, 2013).

In fields other than mental illness, previous techniques aiming at reducing social categorization have incorporated the idea that perceiving overlaps between ingroup and outgroup would reduce such categorization by blurring intergroup boundaries (Crisp et al., 2001; Rosenthal & Crisp, 2006). Interestingly, recent changes in the psychiatric conceptualization of schizophrenia have tended to switch from a very strict categorial

representation of the disorder to a set of symptoms that are continuously distributed in the general population (Johns & van Os, 2001; van Os, 2016). For instance, psychotic experiences such as delusions and hallucinations are also present in the general population (for a review, see Johns & van Os, 2001). Recent findings suggest that continuum beliefs reduce public stigmatization (Thibodeau et al., 2018; Wiesjahn et al., 2016). In these studies, believing that schizophrenia is not a discrete entity but a constellation of symptoms continuously distributed within the general population was associated with less fear, social distance, perceived difference, essentialist beliefs, stereotype beliefs, and with more pro-social reactions and social acceptance (Makowski, Mnich, Angermeyer, & von dem Knesebeck, 2016; Schlier, Scheunemann, & Lincoln, 2016; G. Schomerus et al., 2016; Schomerus, Matschinger, & Angermeyer, 2013; Thibodeau, 2017; Wiesjahn, Brabban, Jung, Gebauer, & Lincoln, 2014). Although some studies have reported encouraging effects of continuum belief manipulation in reducing stigma, these effects are generally small. Correlations between self-reported continuum belief and stigma are often around $r = .20$, suggesting that even an unusually potent continuum intervention may do little to positively affect stigma in the long run. Moreover, some continuum intervention studies have reported null effects and, as the authors noted, one study (Thibodeau & Peterson, 2018) showed that a particular kind of continuum intervention can be damaging. These previous results highlight the importance of further specifying the underlying mechanisms of continuum beliefs to understand how they might have a significant effect on stigma reduction.

In this study, we suggest that continuum beliefs increase the perceived similarities between oneself and people with schizophrenia. Perceiving such similarities may enhance the perception of overlapping categories between the general population and schizophrenia, acting as a *recategorization mechanism* (Brewer, 2007; Gaertner et al., 1993), and thus reducing the boundaries between the self and people with schizophrenia. According to this

model, people with schizophrenia may look more like the self, thereby reducing subsequent stigmatizing beliefs such as essentialist ones.

Furthermore, a reciprocal hypothesis could be formulated: when continuum beliefs are activated, the self may look more like persons with schizophrenia, leading to the self-attribution of features associated with the stereotype of schizophrenia (*i.e. self-stereotyping*, DeMarree & Loersch, 2009; Guimond et al., 2006). We hypothesized that three steps can be described in the self-stereotyping process following continuum beliefs activation. First, continuum beliefs induce perceived similarities between the self and people with schizophrenia. Second, participants compare themselves to people with schizophrenia on the basis of their similarities. As proposed in the Selective Accessibility Model (Mussweiler, 2003), when participants perceive strong similarities between their self and the target, they will compare themselves by selectively searching for standard-consistent target knowledge. Third, the activated content is misattributed to the self, resulting in subsequent self-stereotyping (see Active self-account model, DeMarree & Loersch, 2009). This mechanistic view of self-stereotyping is in accordance with the idea the boundaries between the self and nonself are permeable, and that people sometimes get confused about whether the activated mental contents are attributable to the self, other, or the situation (Loersch & Payne, 2014; Wheeler et al., 2007).

1.1 Aims of the study

The study investigated (i) the effect of continuum beliefs on public stigma and self-stigma in schizophrenia, and (ii) the mediation of perceived similarities on this effect. The first hypothesis was that the activation of continuum beliefs reduces essentialism (*i.e. public stigma*) and enhances self-stereotype association (*i.e. self-stigma*) in the general population. The second hypothesis was that perceived similarities mediate the effect of continuum beliefs on essentialism and the self-stereotype association.

2. Methods

The current study was preregistered on the Open Science Framework (<https://osf.io/hvfu5/>).

Videos, text scripts, scales, R / SPSS scripts and data are also available via the OSF link.

2.1 Procedure and participants

The present study was conducted in accordance with French bioethics laws (Jardé law, May 9, 2017) involving human beings. All participants gave a written informed consent after the study design had been explained to them according to a standardized procedure. In order to protect participants' anonymity, several parameters were blocked and not registered by Limesurvey® (IP address, date and time when completing the survey). Data were collected via an on-line survey. The study was disseminated via an URL link that randomly assigned participants to one of the three experimental conditions. Recruitment was made via social networks and broadcast lists. We used broadcasts lists to reach students of the University of Bordeaux, in other fields than social sciences to avoid familiarity with social psychology research. Regarding social networks, we shared the URL link of the study in Facebook groups of students of the University of Bordeaux, who further disseminate it to their contacts. We estimated the time for gathering data between one and two months but it actually took 3 weeks, starting in February 2019. Participants did not receive any monetary incentive for their participation.

The survey included 565 respondents over 18 years old from the general population ($M = 26$, $SD = 10.4$): 195 were male (34%). Regarding the total drop outs, 58.17% of the recruited participant completed the study. Exclusion criteria were: having a close family member with a diagnosis of schizophrenia, studying psychology at the university, and not having watched the video entirely. In the preregistered form, we proposed to exclude health professionals.

However, as we could not know for sure if these health professionals were mental health ones, we decided to include them (n = 113, 20%).

2.2 Study design

Participants were randomly assigned to one of the three experimental conditions. The first condition was labelled “Continuum” and was aimed at activating continuum beliefs about schizophrenia (i.e. that schizophrenia is not a discrete social category but is normally distributed in the general population). The second condition was labelled “Categorical” and was aimed at reducing continuum beliefs by increasing categorial beliefs (i.e. believing that schizophrenia is a discrete category). The third condition was “Neutral” and did not manipulate knowledge associated with continuum or categorial beliefs of schizophrenia.

Continuum and categorial beliefs were activated using short videos (1’40’’ and 2’00’’, respectively) adapted from the texts used by Schomerus et al. (2016). The neutral video (1’40’’) was an extract from Nietzsche “The Gay Science”, dealing with the importance of art for human beings. After watching the video, participants were asked whether they had seen it entirely. Then, they were asked what the topic of the video was. This question aimed at ensuring that participants did watch the video entirely. Then, four short scales were administered to measure continuum beliefs, self-stereotype association, essentialism, and perceived similarities. The administration order of the scales was randomized, as were the items in each scale.

2.3 Material

The Questionnaire of Belief in a Continuum in Schizophrenia (QBCS, 4 items) aimed at measuring continuum and categorial beliefs of schizophrenia, and was used as a check for the experimental manipulation (i.e. activation of continuum versus categorial beliefs). Questions were drawn and adapted from Wiesjahn et al. (2014).

The Scale of Perceived Similarities with Schizophrenia (SPSS, 4 items) aimed at measuring perceived similarities between oneself and schizophrenia. The scale was developed in accordance to an expert consensus (research team members) on the basis of Selective Accessibility Model (Mussweiler, 2003), as no scale of perceived similarities between oneself and people of another social group were developed in the literature, to our knowledge.

The Explicit Measure of Self-Stereotype Association (EMSSA, 4 items) measured whether participants attributed to themselves the features (personality traits) associated with the stereotype of schizophrenia. We asked them if “unpredictability”, “maladjusted”, “dangerous”, and “weird” were typical of themselves (from 1: not typical of me at all, to 7: absolutely typical of me). Words were chosen from an unpublished pre-test aimed at capturing words that are the most associated with the stereotype of schizophrenia in the general population. On the basis of the method of Ric, Alexopoulos, Muller, & Aubé (2013), valence was measured in this pre-test on a 7-point Likert-like scale (from -3 to +3) for each word: “maladjusted”: $M = -1.48$; “dangerous”: $M = -2.53$; “unpredictable”: $M = -0.32$, and “weird”: $M = -0.31$.

The Essentialism Schizophrenia Scale (ESS, 16 items, adapted from Haslam, Rothschild, & Ernst, 2000) was composed of three subscales (“Trait”, “Discretiveness” and “Informativeness”). This scale was aimed at measuring stereotype (Bastian & Haslam, 2006; Yzerbyt et al., 2001), understood as knowledge about a social category, and which is considered as a part of public stigma (Corrigan et al., 2005). Stereotype can be assessed targeting a specific member of a group, or targeting the social group itself (for a review of stereotype measurements, see Corell et al., 2013). Measures targeting the group itself have been widely used in the domain of mental illness (*e.g.* Angermeyer & Matschinger, 2004; Fiske et al., 2002), and are also efficient at predicting prejudice (Kuppens & Yzerbyt, 2012).

Regarding the subscales, *Trait* essentialism measured the belief that symptoms of schizophrenia are malleable or fixed in time. *Discretiveness* measured the belief that people with schizophrenia belong to a discrete and well defined category. *Informativeness* measured the belief that belonging to the social category “schizophrenia” provides relevant information about that person. All scales were Likert-like from 1 to 7. Finally, socio-demographic characteristics such as sex and age were measured. Participants in the “Categorical” condition were specifically informed that schizophrenia is not a categorical disease but is rather a continuum that is more or less present among the general population.

2.4 Hypotheses

Checking for activation of continuum beliefs. Participants in the Continuum condition would have higher continuum belief scores than those in the Categorical condition, as measured with the QBCS (Questionnaire of Belief in a Continuum in Schizophrenia).

Checking for the activation of Perceived similarities between oneself and people with schizophrenia. In the Continuum condition, participants would perceive more similarities between the self and people with schizophrenia than those in the Categorical condition on the

Scale of Perceived Similarities with Schizophrenia.

Effect of experimental condition on essentialism (public stigma). Participants in the Continuum condition would have lower scores on the subscales “Trait”, “Discretiveness” and “Informativeness” of the ESS, compared to the Categorical condition.

Effect of experimental condition on self-stereotype (self-stigma). Participants in the Continuum condition would have higher scores on the EMSSA (Explicit Measure of Self/Stereotype Association) than those in the Categorical condition.

Mediation effect. We expected Perceived Similarities with Schizophrenia to mediate the link between 1) experimental conditions and EMSSA (self-stigma); and 2) experimental conditions and ESS (public stigma).

2.5 Data analytic strategy

First, we checked the validity of the scales using exploratory factor analysis. Then, to test our hypotheses, we carried out one-way Welch ANOVAs (Welch's ANOVA is recommended for unequal sample sizes and heterogeneous variances, Howell, 2013), with "Experimental conditions" as independent variables (three modalities: Continuum, Categorical and Neutral). Dependent variables were: "QBCS Score", "PSS Score", "EMSSA Score", "Essentialism Trait", "Essentialism Discretiveness" and "Essentialism Informativeness" subscale scores. Following these ANOVAs, we performed post-hoc tests to specify the significant differences (if any). In the preregistered form, we used the Least Significant Difference post-hoc test, but we decided to use Game-Howell because it controls for α and does not assume homogeneity of variance. For the mediation analyses with the multicategorical independent variable, we followed the method proposed by Hayes & Preacher (2013). We used R studio, version 3.5.3 to clean data, Jamovi version 1.0.0.0 to perform ANOVAs and exploratory factor analyses, and MEDIATE macro of SPSS to compute mediation analyses with the multicategorical independent variable. The scripts, data and material are available with the OSF link.

3. Results

3.1 Checking for validity of measures

The psychometric properties of the scales were first checked with exploratory factor analysis (EFA). The results are displayed in Table 1.

Insert Table 1 here

Table 1

Title: Exploratory factor analysis of administered scales

Note: Oblimin and minimum residual extraction methods were used. For the sake of clarity, only loadings over .39 are displayed. QBCS: Questionnaire of Belief in a Continuum in

Schizophrenia; PSS: Essentialism Schizophrenia Scale; EMSSA: Explicit Measure of Self-Stereotype Association; F(1 to 4) = Factor (1 to 4).

The EFA of the QBCS revealed two factors that we named “Continuum beliefs” (Factor 1) and “Categorical beliefs” (Factor 2). Results of Spearman correlation analyses showed no significant correlation $r = .03, p = .46$. Regarding PSS, the EFA revealed two factors that we named “Sharing similarities” (Factor 1) and “Being similar” (Factor 2). A weak positive correlation was found, $r = .24, p < .001$. The internal consistency of the whole scale (4 items) was McDonald’s $\omega .65$. Values above $.70$ are routinely considered acceptable when developing a new measure, and $.80$ are acceptable for research purposes such as comparing groups means (Viladrich et al., 2017). We thus choose to use the two factors from the exploratory factor analysis. The EFA also revealed two factors in EMSSA that we named “Weird/unpredictable” and “Dangerous/maladjusted”, which were weakly correlated, $r = .26, p < .001$. Finally, the EFA revealed four factors in ESS, namely “Trait incremental”, “Trait entity”, “Discretiveness” and “Informativeness”. We merged “Trait incremental” and “Trait entity” for further analysis under the name “Trait Essentialism”, as it was theoretically the same construct (Haslam et al., 2000). Correlation analyses revealed that Trait Essentialism was weakly associated with Discretiveness, $r = .13, p < .001$, and with Informativeness, $r = .26, p < .001$. Discretiveness and Informativeness were moderately correlated, $r = .36, p < .001$.

3.2 Checking for activation of continuum beliefs and perceived similarities

To check for activation, we performed an ANOVA, which revealed a significant effect of conditions (Continuum, Neutral, Categorical) on Continuum beliefs $F(2,368) = 5.52, p = .004$. Post-hoc comparisons showed a significant difference between Neutral ($M = 7.77, SD = 2.96$) and Categorical ($M = 6.62, SD = 3.67$) conditions, $t(364) = -3.33, p = .003$.

ANOVA also revealed a significant effect of conditions on Categorical beliefs $F(2,362) = 76.31, p < .001$. Post-hoc comparisons showed differences between Categorical ($M=7.98, SD = 3.56$) and Neutral ($M =4.66, SD =2.31$) conditions, $t(349) = 10.74, p < .001$, as well as between Categorical and Continuum ($M=4.5, SD =2.19$) conditions, $t(336) = 11.8, p < .001$.

ANOVA also revealed a significant effect of conditions on Perceived similarities. First, there was a significant effect of conditions on **Sharing similarities** $F(2,359) = 404, p < .001$. Post-hoc comparisons showed significant differences between Continuum ($M =11.19, SD =2.84$) and Neutral ($M= 6.45, SD = 3$), $t(338) = 15.3, p < .001$ conditions, between Neutral and Categorical ($M=3.52, SD = 2.56$) conditions, $t(319) = -9.88, p < .001$, and between Categorical and Continuum conditions, $t(394) = -28.4, p < .001$. Second, there was a significant effect of conditions on **Being similar** $F(2,358) = 67.8, p < .001$. Post-hoc comparisons showed significant differences between Continuum ($M =4.59, SD =2.58$) and Neutral ($M= 6.36, SD = 2.76$) conditions, $t(336) = -6.26, p < .001$, between Neutral and Categorical ($M=3.24, SD = 2.27$) conditions, $t(312) = -11.6, p < .001$, and between Categorical and Continuum conditions, $t(392) = -5.55, p < .001$. Results are shown in figure 1.

Insert Figure 1 here

Figure 1

Title: Checking for the activation of continuum beliefs and perceived similarities using one-way ANOVA and Game-Howell post-hoc comparisons.

Note: *** $p < .001$. Error bars represent standard deviations.

3.3 Effect of experimental condition on essentialism (public stigma)

Regarding essentialism Trait, ANOVA revealed a significant effect of experimental condition $F(2,370) = 63.3, p < .001$. Post-hoc showed significant differences between Categorical ($M =$

30.7, SD = 6.45) and Neutral (M = 24.7, SD = 5.96) conditions, $t(357) = 9.29, p < .001$, and between Categorical and Continuum (M = 24.2, SD = 6.43) conditions, $t(400) = 10.1, p < .001$, but no difference between Neutral and Continuum conditions $t(355) = -.68, p = .77$.

Regarding Discretiveness, ANOVA showed a significant effect of experimental condition $F(2,344) = 56.9, p < .001$. Post-hoc revealed significant differences between Continuum (M = 10.3, SD = 4.09) and Neutral (M = 14.7, SD = 5.33) conditions, $t(299) = -8.65, p < .001$, between Continuum and Categorical (M = 13.9, SD = 3.48) conditions, $t(387) = 9.4, p < .001$, but no difference between Neutral and Categorical conditions $t(266) = -1.72, p = .19$.

For Informativeness, ANOVA revealed a significant effect of experimental condition $F(2,369) = 173, p < .001$. Post-hoc comparisons showed significant differences between Categorical (M = 21.4, SD = 5.73) and Neutral (M = 12.4, SD = 5.05) conditions, $t(361) = 15.9, p < .001$, between Categorical and Continuum (M = 12.4, SD = 5.15) conditions, $t(397) = 16.6, p < .001$, but no difference between Continuum and Neutral conditions $t(349) = -0.09, p = .99$.

Results are shown in figure 2.

Insert Figure 2 here

Figure 2

Title: Results of effect of experimental condition on essentialism using one-way ANOVA and Game-Howell post-hoc.

Note: *** $p < .001$. Error bars represent standard deviations.

3.4 Effect of experimental condition on self-stereotype (self-stigma)

To test this hypothesis, we used the results of the EFA on the EMSSA and thus analyzed separately the association of “weird/unpredictable” to the self, on one hand, and “dangerous/maladjusted”, on the other.

Regarding “weird/unpredictable”, ANOVA revealed a significant effect of the experimental condition $F(2,354) = 16, p < .001$. Post-hoc comparisons showed significant differences between Continuum (M = 5.5, SD = 3.38) and Neutral (M = 4.43, SD = 2.9) conditions, $t(359) = 3.24, p = .004$, and between Categorical (M = 3.85, SD = 2.34) and Continuum conditions $t(352) = -5.67, p < .001$, but no differences between Neutral and Categorical conditions, $t(308) = -2.06, p = .10$.

Regarding “dangerous/maladjusted”, ANOVA revealed a significant effect of the condition $F(2,372) = 246, p < .001$. Post-hoc comparisons showed a significant difference between Categorical (M = 10.43, SD = 3.23) and Neutral (M = 4.06, SD = 2.79) conditions, $t(362) = 20.27, p < .001$, between Categorical and Continuum (M = 4.7, SD = 3.1) conditions, $t(400) = 18.2, p < .001$, but no difference between Continuum and Neutral conditions $t(357) = 2.08, p = .097$. Results are shown in figure 3.

Insert Figure 3 here

Figure 3

Title: Effect of experimental condition on self-stereotype using one-way ANOVA and Game-Howell post-hoc comparisons.

Note: *** $p < .001$. Error bars represent standard deviations.

3.5 Mediation analysis of perceived similarities

Mediation analyses with the multicategorical independent variable were computed with multiple linear regressions analyses. Table 2 displays detailed results of all mediation analyses. Figure 4 summarize multicategorical mediation analyses.

Title: Perceived similarities mediate the effect of continuum and categorial beliefs activation on self-stereotyping (EMSSA) and essentialism (ESS).

Insert Figure 4 here

Note: a_1 and a_2 are mean difference in Perceived Similarities between the Categorial and the Continuum condition, respectively, relative to the control condition. b is the slope of Perceived Similarities on Self-stereotype and Essentialism. ; c'_1 and c'_2 are the relative direct effects of Categorial and Continuum conditions, respectively, relative to the neutral condition.

Insert Table 2 here

Table 2

Title: Mediation analysis with multicategorical independent variable and confidence intervals.

Note: *** = $p < .001$, ** = $p < .01$, * = $p < .05$, *ns* = not significant; a_1 and a_2 are mean difference in Perceived Similarities subscales between the Categorial and the Continuum condition, respectively, relative to the Neutral condition. b is the slope of Perceived Similarities subscales on outcomes (EMSSA and Essentialism schizophrenia subscales). c'_1 and c'_2 are the relative direct effects of Categorial and Continuum conditions, respectively, relative to the Neutral condition. When the lower limit (LLCI) and upper limit (ULCI) of confidence intervals cross 0 (e.g. -.290 to .165), the effect of mediation is considered insignificant.

4. Discussion

The first aim of the study was to test the hypothesis that the activation of continuum beliefs reduces essentialism (*i.e.* public stigma) and enhances self-stereotype (*i.e.* self-stigma) in the general population. A secondary hypothesis was that perceived similarities mediate the effect of continuum beliefs on essentialism and self-stereotype association.

The results globally support our hypotheses. Correlation analyses suggested that categorial and continuum beliefs were not negatively correlated but were rather independent. At first glance, continuum and categorial beliefs could be expected to be negatively correlated. In the literature, only three studies investigated both continuum and categorial beliefs to our knowledge. The first study (Thibodeau, 2016) reported a weak nonsignificant negative association between continuum and categorial, $r = -.03$, whereas the second and the third studies reported a significant association, $r = -.61$, (Thibodeau & Peterson, 2018) and $r = -.14$, (Thibodeau, 2019). These mixed results may be the consequences of the chosen population and measures, and further studies are needed to elucidate this point. Moreover, each type of belief has different and specific effects on stereotype (both public and self-stereotype). Indeed, only the categorial versus neutral manipulation reached significance, whereas continuum manipulation did not. It appears clearly that categorial manipulation was stronger than the continuum manipulation regarding both categorial beliefs and continuum beliefs. It is possible that our continuum beliefs manipulation did not fully activated continuum beliefs, but rather activated perceived Sharing similarities. It is however difficult to compare this result with previous studies, as they did not report post hoc comparisons across the 3 groups (Thibodeau et al., 2018; Thibodeau & Peterson, 2018). Categorial manipulation may be more efficient as it reinforces an automatic process already implied in human functioning, *i.e.* social categorization (Guimond et al., 2006), whereas continuum manipulation go against this natural tendency. Continuum beliefs reduced public stigma (essentialism: discretiveness) and

enhanced self-stereotype association (factor “weird/unpredictable”). Conversely, categorial beliefs enhanced public stigma (essentialism: trait and informativeness) and reduced self-stereotype (factor “weird/unpredictable”). Regarding public stigma, the results are in accordance with numerous previous studies reporting the positive effects of continuum beliefs and the deleterious effects of categorial beliefs on psychiatric stigma. Of note, our results are particularly consistent with previous research using the same public stigma construct (i.e. essentialism), reporting a positive influence of continuum beliefs on psychotic symptoms (Schlier et al., 2016).

Additionally, our study provides original information regarding the underlying mechanisms by which categorial and continuum beliefs impact stigma. We found that perceived similarities (especially Sharing similarities) mediate the effects of categorial and continuum beliefs on psychiatric stigma. These results provide support for the Selective Accessibility Model (Mussweiler, 2003) in mental illness stigma research, suggesting that self-stereotype association may be prompted/reduced by manipulation of continuum/categorial beliefs through enhanced/decreased perceived similarities. These results underscore the relevance of including perceived similarities in continuum interventions aimed at reducing public stigma. Further research could be conducted in stigmatized populations. In particular, we hypothesize that continuum beliefs may have larger effects in clinical populations, e.g. people suffering from schizophrenia, as it could reflect a basic human need for belonging to the community, and a way to fight ostracism through need-restorative behaviors (Williams, 2007).

However, some results were unexpected. First, results of factorial analyses showed that there were two dimensions of self-stereotype in our measure: i) “unpredictable”/“weird” (Factor 1), and ii) “maladjusted”/“dangerous” (Factor 2). Each dimension was associated with different levels of negative valence. Indeed, data from the pre-test (see Method section) showed that Factor 2 includes traits with a high negative valence, whereas Factor 1 includes traits with a

low negative valence. Second, continuum/categorical beliefs effects occurred in the expected way only when self-stereotype attributes were slightly negative (i.e. Factor 1 weird/unpredictable). Results were more inconsistent for highly negative self-stereotype attributes (i.e. Factor 2 dangerous/maladjusted). These results suggest that the effects of conditions on self-stereotype dimensions may occur differently depending on the negativity of the targeted attributes. One possible explanation is that highly negative attributes (Factor 2 dangerous/maladjusted) may be too threatening for the self, thus disrupting the effects of continuum beliefs on assimilation processes. Consistently, a recent study reported that the activation of continuum beliefs may also enhance fear and anxiety feelings (Thibodeau & Peterson, 2018). Assimilation of the stereotype of schizophrenia to the self may thus be conditional on the emotional valence of its characteristics.

The study has several limitations. First, the on-line design of the study may have biased the representativity of our sample. Most participants were women and young, and the sample does not reflect the entire general population. Second, most measures were self-reports, which are known to be subject to bias. Implicit measures may be relevant to further specify the mechanisms by which continuum beliefs impact stigmatization.

These findings may have implications for anti-stigma intervention research. First, anti-stigma interventions could be improved by enhancing perceived similarities between individuals. For example, they could present individuals who have been diagnosed with schizophrenia but have recovered (e.g. like Patricia Deegan or Luc Vigneault), and now live a life like everyone. Such knowledge that people diagnosed with schizophrenia can be pretty similar to everyone else (e.g. having a family, hobbies, etc.) may increase perceived similarities, and thus reduce stereotyping. Second, another relevant information for anti-stigma interventions design is that categorical beliefs and continuum beliefs are not correlated in our study, and have specific effects on the stereotype. Thus, these two kinds of beliefs should be targeted separately, by

enhancing continuum beliefs on the one hand, and reducing categorical beliefs on the other hand. Of note, these results partially explain why contact interventions have proved to be effective in reducing the stigmatization of mental illness in the general population. Contact among members of different groups reduces hostility and promotes more positive intergroup attitudes, especially by promoting equal status interactions, and thus reducing the salience of ingroup-outgroup social categorization (Brewer, 2007). Similarly, continuum beliefs effects can be assimilated to a *recategorization mechanism*, as defined by the Common Ingroup Identity Model (Gaertner et al., 1993). This model suggests that contact is effective in reducing intergroup salience (from “Us” and “Them”, to a more inclusive “We”) by enhancing perceived similarities (e.g. status, resources, values). Our data fit this model as continuum beliefs, through perceived similarities, reduced intergroup salience (as measured with Discreteness) and enhanced endorsement of outgroup characteristics (as measured with ‘Weird/unpredictable’ self-characteristic). Further research is needed to test whether the manipulation of continuum beliefs and perceived similarities could also be applied in stereotyped groups, such as schizophrenia, and in highly stigmatizing contexts, such as psychiatric hospitals and other clinical settings.

Disclosure statement

No potential conflict of interest is reported by the authors.

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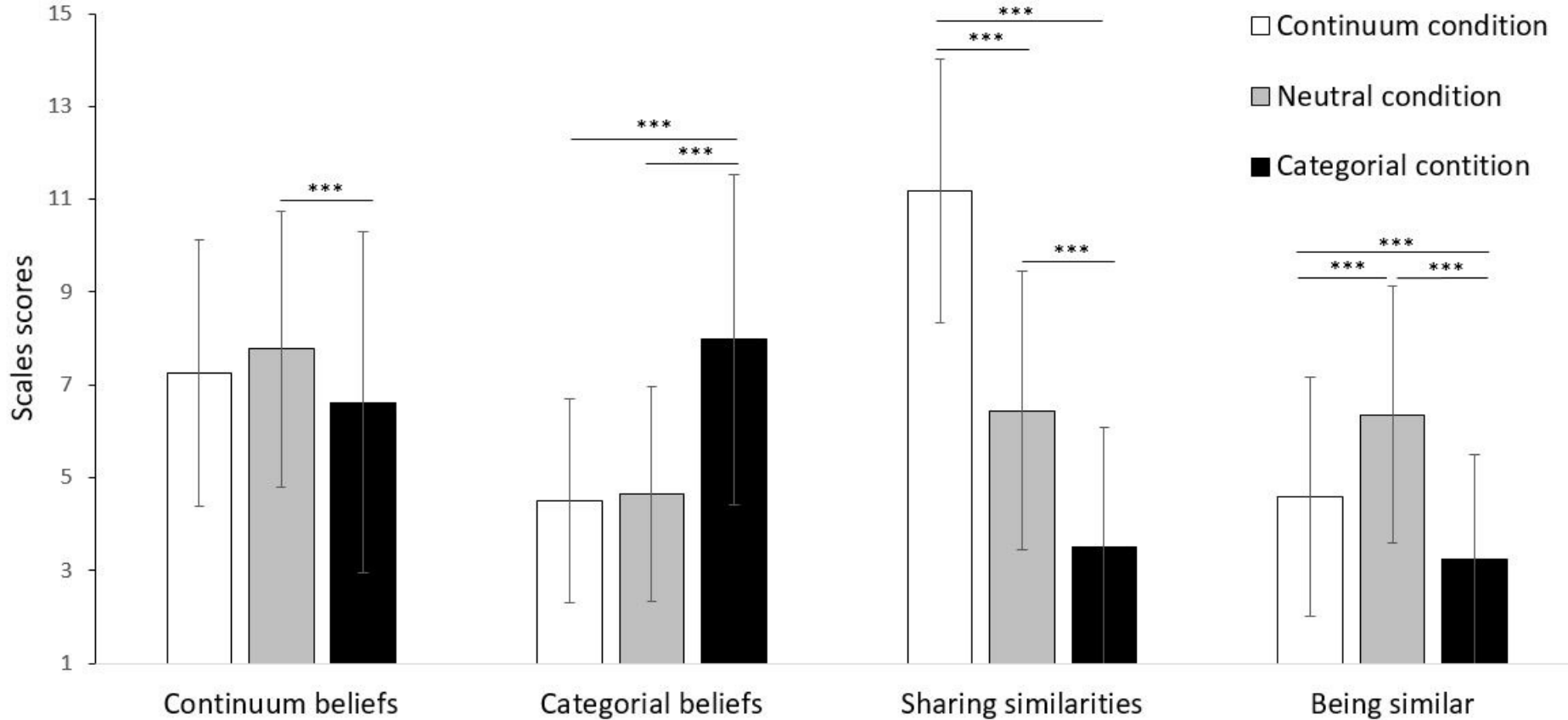
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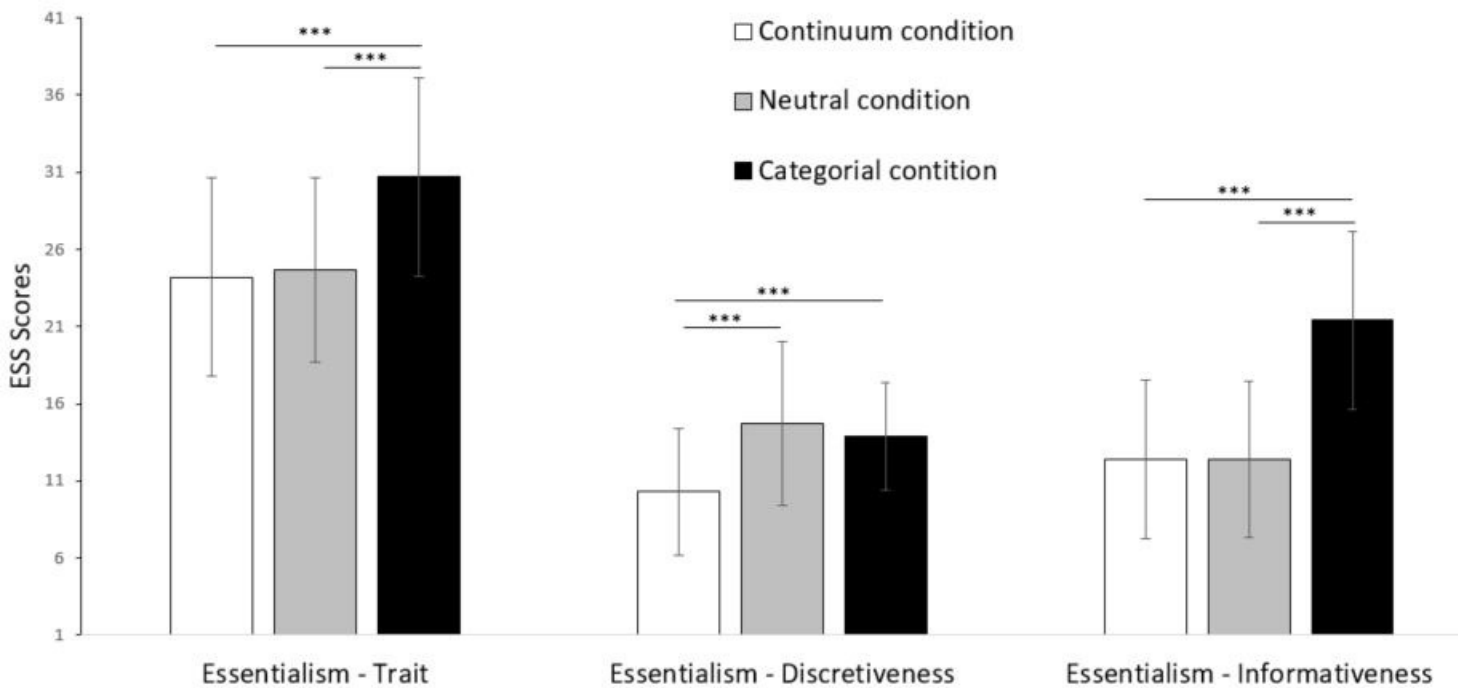
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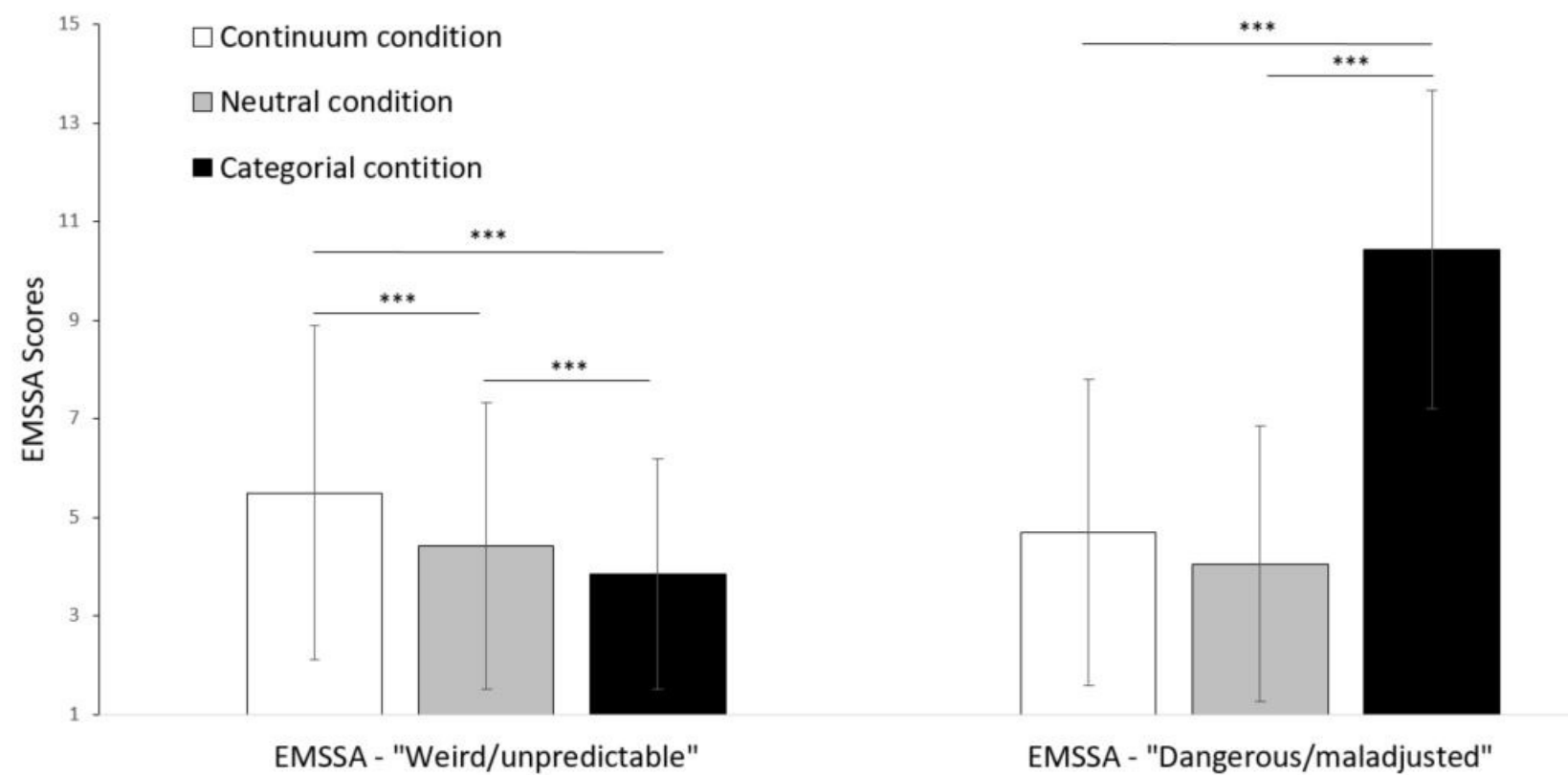
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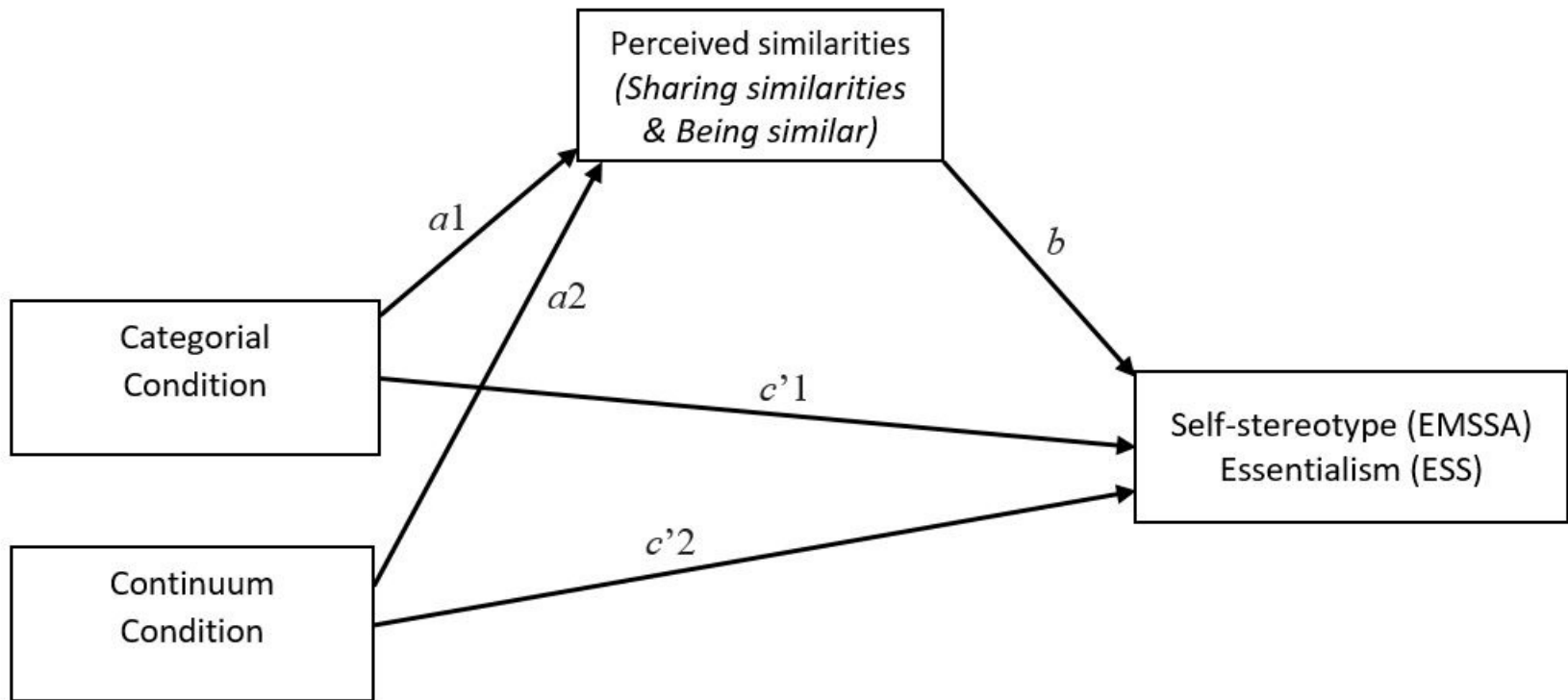
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Scales	Items	Factor loadings			
		Factor 1	Factor 2		
QBCS	Schizophrenia is simply an exaggeration of normal functioning.	1			
	The symptoms of schizophrenia, such as hearing voices or feeling persecuted, are actually common to everyone.	.542			
	There is a clear and well-defined limit between schizophrenia and normality.		.492		
	Schizophrenia involves a state of mind that is fundamentally different from normal.			1	
PSS	I share similarities with people who suffer from schizophrenia.	.726			
	I have many things in common with people who suffer from schizophrenia.	.998			
	Somehow, I am a bit like people with schizophrenia.			.998	
	I have the feeling of being like a person with schizophrenia.			.478	
EMSSA	I am weird.	1			
	I am unpredictable.	.616			
	I am dangerous.			.716	
	I am maladjusted.			1	
ESS		F1	F2	F3	F4
	Whatever you do, the symptoms of schizophrenia do not really change.		.510		
	The symptoms of schizophrenia are fixed and evolve very little over time.		.619		
	Honestly, we cannot change the symptoms of schizophrenia.		.722		
	We cannot do much for the symptoms of schizophrenia		.665		
	The symptoms of schizophrenia can evolve considerably.			.499	
	The symptoms of schizophrenia are malleable and can change a lot over time.			.471	
	No matter how severe the symptoms of schizophrenia are, you can still act on it considerably.			.569	
	One can always have a significant influence on the symptoms of schizophrenia.			.599	
	We are either schizophrenic or not.				.665
	Specific characteristics define the category "schizophrenic", and make possible to know if a person belongs to it or not.				.394
	The boundaries of the "schizophrenic" category are unclear.				.476
	We can more or less belong to the category "schizophrenic", it is not an entire and categorical membership.				.507
	Knowing a person belongs to the category "schizophrenic" tells us a lot about who he/she is.	.843			
	Knowing that a person belongs to the category "schizophrenic" allows us to deduce a lot of other information about him/her.	.832			
In general, it is not very informative to know that a person belongs to the "schizophrenic" category.	.496				
Knowing that a person belongs to the category "schizophrenic" actually gives us very little information about him/her.	.737				

Outcome	Mediator (Perceived Similarities Scale)	<i>a</i>		<i>b</i>	<i>c'</i>		95% bias corrected bootstrap confidence intervals			
		<i>a</i> ₁	<i>a</i> ₂		<i>c'</i> ₁	<i>c'</i> ₂	Continuum		Categorical	
							LLCI	ULCI	LLCI	ULCI
EMSSA “weird/unpredictable”	Sharing similarities	-2.925 ^{***}	4.743 ^{***}	.334 ^{***}	.40 ^{ns}	-.51 ^{ns}	1.158	2.088	-1.327	-.686
	Being similar	-3.12 ^{***}	-1.77 ^{***}	.032 ^{ns}	-.678 [*]	1.01 ^{**}	-.144	.254	-.233	.462
EMSSA “dangerous/maladjusted”	Sharing similarities	-2.925 ^{***}	4.743 ^{***}	.087 ^{ns}	6.633 ^{***}	-.228 ^{ns}	-.045	.880	-.574	.022
	Being similar	-3.12 ^{***}	-1.77 ^{***}	-.224 ^{***}	5.677 ^{***}	.244 ^{ns}	.218	.644	.394	1.046
Essentialism “Trait”	Sharing similarities	-2.925 ^{***}	4.743 ^{***}	.14 ^{ns}	6.455 ^{***}	-1.115 ^{ns}	-.290	.165	-.989	-.173
	Being similar	-3.12 ^{***}	-1.77 ^{***}	.52 ^{***}	7.66 ^{***}	.474 ^{ns}	-1.471	-.512	-2.332	-.986
Essentialism “Discretiveness”	Sharing similarities	-2.925 ^{***}	4.743 ^{***}	-.467 ^{***}	-2.20 ^{***}	-2.182 ^{***}	-2.923	-1.573	.900	1.944
	Being similar	-3.12 ^{***}	-1.77 ^{***}	.528 ^{***}	.816 ^{ns}	-3.461 ^{***}	-1.137	-.602	-2.295	-1.116
Essentialism “Informativeness”	Sharing similarities	-2.925 ^{***}	4.743 ^{***}	-.384 ^{***}	7.85 ^{***}	1.772 ^{**}	-2.697	-.978	.592	1.749
	Being similar	-3.12 ^{***}	-1.77 ^{***}	.180 [*]	9.539 ^{***}	.268 ^{ns}	-.690	-.004	-1.167	.014