Sensitivity to social exclusion in major depressive disorder (MDD) predicts therapeutic outcome after in-patient treatment

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Lack of social interaction and social exclusion might constitute a core problem for individuals suffering from debilitating mental illness including major depressive disorder (MDD) [1]. Experienced feelings of exclusion could elicit behaviour that hinders the therapeutic process and maintains depressive symptoms. Few studies have directly investigated how sensitivity to social exclusion in MDD relates to therapeutic outcome. The scarcity of available literature is surprising given that interventions for mood disorders carry strong psychosocial components [2] and social inclusion among patients with psychiatric disorders is being advocated [1]. In the laboratory, the cyberball paradigm [3-5] has been successfully used to probe feelings of exclusion. In this computer task, a participant is playing a game of toss-the-ball with three other, virtual players. After a short while the participant is being excluded and the three other players only pass the ball amongst each other. This basic experience of social exclusion already elicits robust changes in perception of negative emotions [4] and neural activation in socially-relevant structures [3, 5]. A meta-analysis [6] showed that people with low self-esteem are more sensitive to direct social exclusion, while people with high self-esteem are more sensitive to indirect forms of exclusion. Relatedly, once excluded, individuals engage in ingratiating behaviour and are highly motivated to reconnect with others and prevent further exclusion [7]. Therefore, within the clinic, one might argue that patients sensitive to direct social exclusion (such as low self-esteem) are more motivated for social reconnection and appraisal of the therapist by engaging deeper in the therapeutic process. In this in-patient study, MDD sufferers completed the cyberball task at intake to the clinic. Based on prior work [6, 7], we expected that patients higher in social rejection sensitivity would benefit more from the intervention, possibly by a stronger aim/desire to socially reconnect.

One hundred and forty-one inpatients (76 females, mean age = 42.17 years, SD = 14.93) with MDD and a high level of education (mean = 11.50 years) participated as part of routine clinical assessment. Diagnosis was determined using the SCID-I, II for DSM-IV. Participants completed the NEO-FFI, and the Childhood Trauma Questionnaire at the beginning and the Beck's Depression Inventory (BDI) at the beginning and during the final week at the clinic (mean duration = 78.95 days, SD = 30.81). All inpatients underwent the same intensive treatment regimen (psychopharmacotherapy, one-on-one psychotherapeutic sessions, group therapies). The regional Ethical Committee approved the study. Patients completed the 'cyberball 3' game (~3 mins total) (https://cyberball.wikispaces.com/, e.g. [3, 8]) during the first few days after admission and were instructed to practice "mental visualization on task performance". They were not deceived and not explicitly told that they would be playing against real people [8]. Afterwards, participants completed the Needs/Threat scale, which is standardly used with the task and which consists of 4 subcomponents: *belonging*, *self-esteem, meaningful existence, control* [8]. The regression aimed to examine whether sensitivity to ostracism could predict therapeutic improvement. The outcome variable was the difference in BDI scores between intake and release [BDI score intake – BDI score release] from the clinic. In step 1, we entered general demographic and personality variables, and frequent comorbidities. In step 2, the 4 scores from the post-task questionnaire were added. We additionally assessed specificity of self-esteem by accounting for zero-order correlations and correlations among the need/threat scales. None of these factors influenced the findings (results available upon request). Alpha was $p = .05$, two-tailed.

In the first step, higher neuroticism significantly predicted larger change in depression scores, b = .27, t = 2.58, p = .01. However, adding the 4 social exclusion scores in the second step resulted in a significant improvement of the model (R^2 = .23, R^2 change = 0.08, adjusted R^2 = .13, p = .015, Cohen's f^2= 0.30, power = .99). Lower *self-esteem,* but none of the other need/threat scales, predicted larger improvement of depression (b = .30, t = 2.59, p = .01)(Table1). No other factor was significant. Additionally, the regression was re-run using only self-esteem as predictor, which also resulted in a significant improvement of the model in the second step (R^2 = .18, R^2 change = 0.04, adjusted R^2 = .10, p = .016, Cohen's f^2= 0.22, power = .99).

This study assessed the contribution of social rejection sensitivity in therapeutic outcome, which might bear implications for therapy and practice. Lower self-esteem predicted greater reductions in depressive symptoms at discharge from the clinic. Consistent with prior work [9], neuroticism predicted reduction in depressive symptoms and might show that ostracized individuals are motivated for social reconnection and engage in ingratiating behaviour [7], even possibly in the therapeutic process. The data are also consistent with prior findings by which individuals with low self-esteem but not high self-esteem are particularly sensitive to direct social exclusion [6]. Unfortunately, the mechanisms by which social rejection maintains or precipitates depression are still unclear. Recent attempts suggest a bidirectional relationship between peer rejection and depressive symptoms [10], supported by data from the cyberball task in patients with borderline personality disorder who reported being more focused on the negative emotions of the other players suggestive of a clear negative bias [4]. However, maladaptive brain responses to ostracism could also constitute risk factors given clinical data suggesting a reduced

activation of the ventrolateral prefrontal cortex during social exclusion [5]. Unfortunately, genetic vulnerability or environmental factors beyond those captured by the CTQ cannot be ruled out. Additionally, this study relied on the need/threat scale frequently used with this task [3, 8] to determine components of social exclusion whereas future work could use direct measures to specifically assess self-esteem and use a comparison group or task. Importantly, future work will need to show which specific psychotherapeutic programs are more beneficial for patients with low self-esteem given that inpatients received several treatment programs simultaneously, albeit with a strong CBT focus. Our tentative data show that sensitivity, and self-esteem in particular, is predictive of therapeutic outcome after hospitalization and call for more detailed consideration and investigation of social exclusion measures in MDD and other pathologies.

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Conflict of interest

None

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	Model	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
	(Constant)	-2.521	9.597		-.263	.793
	Age	-.032	.055	-.052	-.575	.566
	Sex	-.480	1.672	-.026	-.287	.775
	Number diagnoses	-.010	.862	-.001	-.012	.991
	Anxiety disorder	3.029	2.087	.136	1.451	.149
	Eating disorder	-.981	2.486	-.037	-.395	.694
	Personality disorder	1.191	1.960	.064	.608	.544
Step 1	CTQ Total Score	-.042	.059	-.067	-.707	.481
	Neuroticism	**.335**	**.130**	**.270**	**2.578**	**.011**
	Extraversion	-.061	.128	-.047	-.473	.637
	Openness	-.005	.111	-.004	-.042	.967
	Agreeableness	.135	.136	.092	.992	.323
	Conscientiousness	.015	.109	.013	.141	.888
	Treatment duration	.036	.030	.118	1.199	.233
	(Constant)	1.158	10.486		.110	.912
Step 2	Age	-.015	.055	-.025	-.279	.781
	Sex	-.275	1.630	-.015	-.169	.866
	Number diagnoses	-.309	.840	-.044	-.368	.714

Anxiety disorder	3.670	2.133	.165	1.721	.088
Eating disorder	-.169	2.422	-.006	-.070	.945
Personality disorder	.767	1.912	.041	.401	.689
CTQ Total Score	-.053	.058	-.085	-.915	.362
Neuroticism	.244	.138	.196	1.769	.079
Extraversion	-.127	.128	-.099	-.986	.326
Openness	-.060	.110	-.047	-.547	.586
Agreeableness	.126	.133	.086	.947	.346
Conscientiousness	.008	.105	.007	.078	.938
Treatment duration	.035	.029	.115	1.210	.229
Belonging	1.352	1.159	.112	1.167	.246
Self esteem	**1.934**	**.745**	**.304**	**2.595**	**.011**
Existence	-.933	.586	-.177	-1.591	.114
Control	-1.516	.885	-.149	-1.712	.089