

# Rejection sensitivity and its relationship to schizotypy and aggression: current status and future directions

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Rejection sensitivity (RS) is the expectation of being distanced from and excluded by others, and found to be positively associated with both schizotypal personality traits and aggression. Here, we propose different explanations for these associations. Specifically, we suggest that disorganisation and social anxiety explain RS in schizotypy, but anger and the need for reward from retaliation and mood repair explain RS in aggression. There is some support for our suggestions from recent studies showing neural activity and/or connectivity patterns during social rejection that indicate deficient emotional regulation and anxiety in schizotypy, but heightened social pain and retaliation in relation to aggression. Further research needs to firmly establish how RS, schizotypy and aggression might exist, or co-exist, at the behavioural and brain levels, and whether interventions that specifically target social anxiety, maladaptive emotion regulation, or promote prosocial behaviours could be employed to normalise RS in the context of schizotypy and/or aggression.

## Addresses

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## Introduction

Rejection sensitivity (RS) has been defined as the expectation of rejection from others or exclusion by others in interpersonal situations [1]. It includes feeling vulnerable about being accepted due to insecurity in close relationships [2] and the need for social support [3]. RS is partly considered to be a learned response, and this learning

appears more resistant to ambiguous extinction in rejection-sensitive individuals [4]. Experiencing a mild form of social rejection may not be a problem for individuals who have low-to-normal RS and high resilience, because RS is often encountered when seeking affiliation, and because resilience might help people cope with rejection and stressful events [5]. According to the defensive motivational system model, experiencing rejection can also prepare the person for dealing with future rejection [6]. Heightened RS, however, is found to be a significant risk factor for psychiatric disorders, such as schizophrenia, and externalising problems, such as aggression [7,8].

In this paper, we aimed to review recent and relevant evidence with a view to probe potential pathways or explanations for elevated RS specifically in people with a high level of schizotypal personality traits or aggression. We considered both psychosocial factors and neural responses to social rejection in the context of individual differences in schizotypy and aggression. Before presenting our main observations and discussing their implications for future work, we note that in most of the reviewed behavioural studies RS was typically measured by self-report scales, such as the Adult Rejection Sensitivity questionnaire [1], the Interpersonal sensitivity scale [9] and the Patient Rejection Scale [10]. In some studies, RS was also measured experimentally, most commonly using a virtual ball-tossing task that mimics social rejection, known as the Cyberball task [11]. In Cyberball, the participant is led to believe that the imaginary players are real and hence, the participant feels rejected when the imaginary players stop passing the ball to the participant.

## RS and schizotypy: the roles of disorganisation and anxiety

Schizotypy is a cluster of personality traits that denote a putative liability for schizophrenia-spectrum disorders and the psychoses [12–14]. Three predominant factors constitute schizotypal traits, namely, positive schizotypy, negative schizotypy and disorganisation [15]. Positive schizotypy refers to perceptual aberrations, magical and paranormal beliefs, delusional beliefs and referential thinking. Negative schizotypy refers to avolition, a lack of pleasure in physical and social activities and social withdrawal. Disorganisation is characterized by social anxiety, poor memory and concentration, moodiness and poor decision-making [16]. These traits exist along the subclinical-clinical schizophrenia spectrum [17]. Heightened RS has also been reported to be present all along the subclinical-clinical schizophrenia spectrum

[18<sup>\*</sup>]. For example, there is evidence of self-reported RS relating to a higher level of schizotypal traits in a healthy volunteer sample [19<sup>\*</sup>]. Participants at risk for schizophrenia and participants with a high level of schizotypy also report experiencing more paranoia following the Cyberball task than healthy controls [18<sup>\*</sup>]. In another study, greater hostility by a close relative was reported by people with high schizotypy, compared to those with low schizotypy [21]. While the family is a typical social context in which social rejection may be encountered all along the schizophrenia spectrum [18<sup>\*</sup>,21], interpersonal deviance may generalise to other interpersonal situations. For example, participants with a high level of perceptual aberrations are found to be more avoidant when interacting with strangers and this in turn makes the strangers anxious, angry and less interested [22<sup>\*</sup>]. Such avoidant behaviour may elicit the very rejection that they seek to avoid in their interaction partners [23]. It is clear that high RS and schizotypy coexist across many interpersonal contexts.

Further to this RS-schizotypy link that was present in the above-mentioned studies, a recent study [19<sup>\*</sup>] suggested that disorganisation has the strongest relation with RS, of the three broad schizotypal factors mentioned earlier. There may be many reasons for this. Firstly, RS may contribute to social anxiety, and social anxiety, in turn, may feed into disorganisation. Interestingly, neuroticism, the tendency to focus on negative emotions and experience anxiety in interpersonal situations [24], was found to explain the relationship between disorganisation and RS in the same study [19<sup>\*</sup>], further supporting the role of social anxiety in the RS-schizotypy relationship. Secondly, disorganisation denotes confusion in schizotypy and thought disorder, communication deviance and odd speech in schizophrenia [25,26]. It is therefore plausible that social rejection contributes to such confusion, and such states have been considered as the key features of disorganisation [27]. Although disorganisation has often been considered secondary to positive and/or negative schizotypy in the existing literature [27], we believe that it is of interest in its own right in the context of the RS-schizotypy association. Thirdly, being dissatisfied about one's social and psychological quality of life and being less agreeable were also found to partly explain the relationship between disorganisation and RS [19<sup>\*</sup>]. Poor social quality of life is where one performs poorly in and feels dissatisfied with social activities [28]. Poor psychological quality of life is where one has low self-esteem and poor body image. Such perceptions of poor social and psychological quality of life, possibly through social anxiety, appear to strengthen the link RS-disorganisation link.

### **RS and aggression: the roles of anger, and retaliation for reward and mood repair**

Aggression is the behaviour constituting an intention to inflict harm upon a victim who is motivated to avoid the

harm [29]. Aggression can be physical, for example, hitting, pushing and kicking, or relational, for example, threats of friendship withdrawal, spreading rumours or malicious gossip, and giving the 'silent treatment' [30]. There appears to be a strong role of RS in reactive aggression [31], especially when the person is angry rather than anxious [32<sup>\*\*</sup>]. Reactive aggression arises from retaliation to perceived threat or provocation, and such behaviour is impulsive, thoughtless and driven by anger [33]. According to an account of RS framed in terms of the defensive motivational system, RS offers immediate responses to social threat, but it can be maladaptive and lead to retaliation and reactive aggression in self-defence if used indiscriminately [6]. Acts of retribution and sadism can happen out of the need to restore positive mood and also explain the link between RS and aggression [34<sup>\*\*</sup>]. Furthermore, RS plays a role in peer victimisation [30,31], a kind of relational aggression where the aggressor targets the victim with the intention of harming, intimidating and dominating the victim [35,36]. Behaviours concerned with peer victimisation are intentionally damaging or they manipulate the victim's interpersonal relationships and threaten to destroy these relationships [37]. Experiencing peer rejection in early childhood predicts the likelihood of being victimised later [30]. The social process model states that peer rejection makes children vulnerable to being victimised because they are unable to defend themselves and have poor emotional regulation [30]. Aggressive victimisation is a form of retaliation where the victim is emotionally charged, oppositional and provocative, yet engages in reactive and dysregulated forms of aggression [35,38]. Adolescents are more likely to be rejected by their peers and incur relational aggression when they are relationally and physically aggressive [38]. An aggressive victim is more likely to experience peer rejection, have fewer friends, be male and have emotional dysregulation [35]. Thus, anger, retribution, the need to normalise or restore positive mood, emotional dysregulation and victimisation may explain the RS-aggression link.

### **Insights from neuroimaging and psychophysiological studies into RS in schizotypy and aggression**

According to the findings of two meta-analyses [39,40<sup>\*\*</sup>], the ventral striatum, ventrolateral prefrontal cortex (VLPFC), inferior and superior frontal gyri and posterior insula are commonly activated during experimental paradigms depicting social rejection [39,40<sup>\*\*</sup>]. The ventral striatum is activated when experiencing reward or satisfaction from successfully regulating rejection and other types of negative affect [41,42<sup>\*</sup>]. The VLPFC is involved in regulating the emotional response to social rejection, and the VLPFC and ventral striatum can exert an inhibitory influence on the dorsal anterior cingulate cortex (dACC) [41,42<sup>\*</sup>], an area known to be involved in processing rejection [43<sup>\*</sup>,44,45], physical pain [43<sup>\*</sup>], conflict detection, error-monitoring and integrating information

about the future outcome of an event [44]. However, the dACC was not found to be consistently activated in these meta-analyses [39,40<sup>\*\*</sup>], possibly due to the use of different social rejection paradigms (for example, Cyberball and feedback from peers) as well as varying baseline conditions in different studies [41]. Furthermore, there may be participant-related factors as adolescents and adults are found to differ in their neural response to social rejection [39]. For example, Cyberball mainly activates the VLPFC and ventral striatum in adolescents [39] and the posterior cingulate cortex, posterior insula and subgenual ACC in adults [40<sup>\*\*</sup>], suggesting age-related differences in brain regions involved in mentalising ability. The heightened activation of the ventral striatum and VLPFC in adolescence may signify maturation-related effects [39]. Alternatively, it may also reflect the greater effort that adolescents may need to successfully deal with social rejection because they have a lower pain threshold for rejection and a weaker resistance to peer influence than adults [41]. In terms of the psychophysiological response to rejection, RS has been found to be associated with diminished physiological arousal (as indexed by salivary alpha-amylase reactivity) from the Trier Social Stress Test, a laboratory measure of social stress [46]. A diminished cortisol response during social stress has also been found to be associated with lower dACC activity during the Cyberball task [47]. These findings indicate that diminished physiological arousal may sometimes coexist with a diminished neural response to social rejection, and that RS may involve a hypo-responsive stress response system when tested experimentally using (phasic) social stressors [46], although it may also be associated with a hyper-responsive stress response system (higher baseline) albeit with a reduced capacity to respond to phasic or laboratory stressors. Next, we consider the effects of schizotypy and aggression in neural activations elicited by different social rejection paradigms.

In one study [20<sup>\*\*</sup>], people with a high level of positive schizotypy, relative to those with a low level of schizotypy, showed lower activation of the dACC and VLPFC while watching pictures depicting social rejection scenes. As the dACC and VLPFC are found to be activated during psychological or physical pain and emotion regulation [39,43<sup>\*</sup>,44], this finding may suggest deficient modulation of the emotional response to social rejection scenes in people with a high level of schizotypy. In another study [48], greater P300 amplitude in the parietal region during the viewing of social rejection scenes (suggesting greater attention to these pictures) was associated with negative schizotypy. Interestingly, this greater P300 amplitude-negative schizotypy association was mediated by neuroticism [48], once again highlighting the role of interpersonal anxiety in the RS-schizotypy link. There is also some evidence that, as argued earlier, disorganisation could play a crucial role in this link. Specifically, Premkumar and colleagues [12] found that disorganisation was associated

with heightened physiological arousal when participants were in discussion with a stranger. Disorganisation also explained the relationship between positive schizotypy and this physiological arousal during the discussion [12]. These findings further support the argument that disorganisation overrides other schizotypy traits in the link between schizotypy and social stress. It is argued that positive schizotypy in itself is benign and that it becomes distressing when coupled with disorganisation [13,49<sup>\*</sup>].

Retaliatory aggression has been induced experimentally by asking participants to administer noise blasts of increasing volume to an imaginary opponent who the participants believe is real [42<sup>\*</sup>,50,51]. In such experiments, the ventral striatum and VLPFC are typically activated [42<sup>\*</sup>,50,51]. The involvement of the ventral striatum in such retaliatory aggression has been taken to mean that feelings of pleasure and reward are associated with such retaliation [51]. The experience of retaliatory aggression in such an experiment was found to be associated with the dACC activation when encountering social rejection in the Cyberball task [50], and this association may signify the earlier suggested link between the pain of social rejection and retaliation. In another study [42<sup>\*</sup>], reduced connectivity between the ventral striatum and the VLPFC was found to mediate the association between physical aggression and retaliatory aggression, possibly suggesting that insufficient (VLPFC-based) emotional regulation of social rejection disinhibits pleasure-seeking through retaliation.

## Conclusions and outlook

Both schizotypy and aggression are associated with elevated RS, but the pathways from RS to schizotypy and aggression are likely to differ, depending on the level of anxiety and anger elicited by RS [32<sup>\*\*</sup>] and the successful use of emotional regulation strategies to minimize the level of perceived threat [35]. We tentatively suggest that disorganisation and social anxiety explain the link between RS and schizotypy [12,19<sup>\*</sup>]. We further suggest that anger, maladaptive response to social threat, pleasure from retaliation, and the need to restore positive mood are the primary factors explaining the link between RS and aggression [34<sup>\*\*</sup>,42<sup>\*</sup>,51]. This difference in the trajectory from RS to schizotypy and aggression also appears to be apparent in fMRI studies of RS. While the dACC and VLPFC activity is found to be reduced, signifying diminished social pain and/or poor emotional regulation in people with high schizotypy [21], the opposite is seen in relation to aggression. In aggression, further aberrations are present in the form of reduced VLPFC-ventral striatum connectivity, signifying a maladaptive emotional response to social threat and a possible disconnection between brain centres for emotional regulation and pleasure [42<sup>\*</sup>,50]. However, there are only a few fMRI studies that directly addressed the relationship of RS to schizotypy [20<sup>\*\*</sup>,21] or aggression [42<sup>\*</sup>,50]. Furthermore, no neuroimaging study has yet to

examine the RS-schizotypy and RS-aggression links within the same sample. We now outline some potential areas for future enquiry.

First, multimodal studies with sufficiently large samples and ecologically valid paradigms tapping into social rejection (e.g. while interacting with, or in response to criticism and praise from, family members and strangers) are needed to robustly examine how RS, schizotypy and aggression might exist, singularly and in combination, at the brain and behaviour levels. Future work should also pay attention to previously reported developmental differences in the neurobiology of RS [39,40\*\*], and ideally should study children, adolescents and adults stratified by participants' age and sex. Such studies should be easily achievable and would be theoretically important, given that some well-established measures of schizotypy include indices of antisocial behaviour and impulsivity [16], and there are well-known links between schizophrenia and violence, including verbal and physical aggression [52].

Second, it would be valuable to explore the potential utility of existing or novel interventions that enhance cognitive control over processing of social threat, such as virtual-reality exposure therapy for social anxiety [53,54], in normalising RS in the context of schizotypy and aggression. Interventions that promote prosocial behaviours would also be relevant, especially for adolescents, since prosocial behaviours are found to buffer the relationship between peer rejection and relational aggression [38]. Mindfulness-based activities or interventions might also be of interest since mindfulness is reported to correlate with lower RS, and emotional regulation partly mediates this association [55].

Lastly, it would be extremely important for societal benefits as well as theoretical advancement to examine, in longitudinal within-subjects designs, whether a stable change in RS with interventions targeting relevant pathways (e.g. social anxiety, anger) leads to corresponding long-term reductions in relevant facets of schizotypy, especially disorganisation, or aggression, and normalisation of associated brain activity and connectivity patterns.

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### Conflict of interest statement

Nothing declared.

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## 6 Neurobiology of temperament, personality and psychopathology: what's next?

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