Neural, physiological and behavioral correlates of empathy for pain in Tourette syndrome

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Background:
In addition to the defining features of motor and vocal tics, patients with Tourette syndrome (TS) show diverse symptoms of altered social behaviors, such as echophenomena, coprophenomena, emotional dysregulation and difficulties in social cognition tasks. Furthermore, they report increased personal distress in emotional situations. It has been suggested that these symptoms reflect increased mirroring or sharing of others' experience, possibly together with decreased mentalizing about others. We tested this using an empathy for pain paradigm together with EEG recordings, focusing on mu suppression over the sensorimotor cortex as putative neural marker for the mirror neuron system (MNS).
Methods:
Fifty participants (25 persons diagnosed with TS, 25 age-, gender and education matched controls) underwent an empathy for pain paradigm, while we measured EEG and EDA. Pictures of hands and feet in painful or neutral situations were presented in two conditions: normal pain sensitivity of the actor in the picture versus enhanced pain sensitivity. Participants were asked to rate the painfulness for the actor as well as for themselves in a subset of the trials. Furthermore, we tested the frequency of echophenomena with a video protocol and collected extensive clinical data. Changes in mu suppression during the observation of the pictures, as well as pain ratings and skin conductance response were compared between groups and were correlated with the occurrence of echophenomena, self-reported empathy and clinical measures.
Results:
Our patient sample showed more echophenomena than controls. In the empathy paradigm, the two groups did not differ on the behavioral level. Controls showed the predicted increase of mu suppression when watching painful compared to neutral actions, but TS patients did not show this effect. Mu suppression correlated positively with self-reported perspective taking and negatively with personal distress, while pain ratings correlated positively with measures of tic severity. Both patients and controls showed slightly enhanced skin conductance responses to painful stimuli.
Conclusions:

Our results do not support the hypothesis of higher empathy for pain in TS. On the contrary, TS patients showed less pain-related mu suppression compared to controls, did not differ from controls in their pain-related skin conductance responses and showed no behavioral differences. Our results question the hypothesis of an overactive MNS in TS and highlight the need for more research on social cognition and behavior in TS.