

## An Open Trial of Mobile-Assisted Cognitive Behavioral Therapy for Negative Symptoms in Schizophrenia: Pupillometry Predictors of Outcome

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**Abstract :** Negative symptoms are an important unmet treatment needed for schizophrenia. We conducted an open trial of a novel blended intervention called mobile-assisted cognitive behavior therapy for negative symptoms (mCBTn). mCBTn is a weekly group therapy intervention combining in-person and smartphone-based CBT (CBT2go app) to improve experiential negative symptoms in people with schizophrenia. Both the therapy group and CBT2go app included recovery goal setting, thought challenging, scheduling of pleasurable activities and social interactions, and pleasure savoring interventions to modify defeatist attitudes, a target mechanism associated with negative symptoms, and improve experiential negative symptoms. We tested whether participants with schizophrenia or schizoaffective disorder (N=31) who met prospective criteria for persistent negative symptoms showed improvement in experiential negative symptoms. Retention was excellent (87% at 18 weeks) and severity of defeatist attitudes and motivation and pleasure negative symptoms declined significantly in mCBTn with large effect sizes. We also tested whether pupillary responses, a measure of cognitive effort, predicted improvement in negative symptoms mCBTn. Pupillary responses were recorded at baseline using a Tobii pupillometer during the digit span task with 3-, 6- and 9-digit spans. Mixed models showed that greater dilation during the task at baseline significantly predicted a greater reduction in experiential negative symptoms. Pupillary responses may provide a much-needed prognostic biomarker of which patients are most likely to benefit from CBT. Greater pupil dilation during a cognitive task predicted greater improvement in experiential negative symptoms. Pupil dilation has been linked to motivation and engagement of executive control, so these factors may contribute to benefits in interventions that train cognitive skills to manage negative thoughts and emotions. The findings suggest mCBTn is a feasible and effective treatment for experiential negative symptoms and justify a larger randomized controlled clinical trial. The findings also provide support for the defeatist attitude model of experiential negative symptoms and suggest that mobile-assisted interventions like mCBTn can strengthen and shorten intensive psychosocial interventions for schizophrenia.

**Keywords :** cognitive-behavioral therapy, mobile interventions, negative symptoms, pupillometry schizophrenia

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