



Letter to the Editor

Comparing static and dynamic predictors of risk for hostility in serious mental illness: Preliminary findings



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Hostility
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Dear Editors,

Recent research has emphasized the importance of dynamic assessment using affordable technology (e.g. Fisher, 2015). An area which can benefit from the greater temporal resolution of dynamic predictors is violence prevention, which has traditionally used static variables (e.g. male gender, past history of violence, history of psychosis), and clinician judgements, with minimal success (Fazel et al., 2012). In improving prediction, targeting the relatively more common precursor of hostility may also permit earlier intervention.

Objective and subjective dynamic state predictors may perform differently in predicting hostility. Vocal expression is a promising objective assessment target because it can be unobtrusively measured. Two aspects of vocal expression, jitter (fluctuations in pitch) and shimmer (fluctuations in volume) are related to clinically-rated hostility (Cohen et al., 2016). Each can be measured from recordings of speech, such as from a story retelling task.

As for subjective dynamic variables, positive affect may be related to hostility, as manic episodes are times of particularly high risk for violence (Volavka, 2013). Similarly, negative affect may predict hostility as prospectively predicts aggressive urges (Scott et al., 2017). This study hypothesized that both objective (e.g., jitter, shimmer) and subjective (i.e. self-reported positive and negative affect) dynamic variables would explain more variance in hostility than static variables (e.g. gender, legal history, lifetime psychosis diagnosis, clinician rated hostility).

There is some evidence suggesting serious mental illness is associated with increased risk of violence, though the majority of individuals with serious mental illness are not violent (Choe et al., 2008). Furthermore, individuals with serious mental illness are more likely to have past history of psychosis, allowing for inclusion of that characteristic as a predictor. Stable outpatients ($N = 25$) living in a group home facility and receiving treatment for a serious mental illness participated in this study. The sample was 48% male and 68% had a lifetime history of psychosis, per a structured clinical interview (Structured Clinical Interview for DSM-5 Disorders, First et al., 2015). This interview includes assessing for past legal trouble, and 16% of participants disclosed a

criminal history of violence. The Expanded Brief Psychiatric Rating Scale (Ventura et al., 1993) was conducted on the day of the first session of ambulatory assessment and assessed clinician ratings of hostility over the past two weeks ($M = 1.76$, $SD = 1.16$, range = 1–4). Ambulatory assessment was conducted via the *delta* Mental Status Examination, a mobile application (app) we developed to collect ambulatory behavioral and mental state assessments. Participants completed the app once daily for five consecutive days, responding to a variety of tasks and assessments including the self-report state assessments and a digitally recorded speaking task described here. Assessments of hostility were given between one and three times over the course of the study, for a total sample of 49 assessments. Participants were compensated \$5 for each completed daily assessment, up to \$25.

To measure the criterion variable, hostility, participants responded to a prompt asking: “Do you feel like harming anyone?”, with possible answers ranging from “Not harm anyone” (0) to “Definitely harm someone” (100) on a digital slider scale ($M = 16.76$, $SD = 30.65$). Self-report affect was measured on the same slider scale with anchors changed to reflect intensity of the state, ranging from “Not ____” (0) to “Very ____” (100). Each session, participants provided responses to five positive affect and five negative affect related sliders, drawn from a bank of positive (i.e., hopeful, calm, appreciated, strong, concentration, happy, energetic) and negative (i.e. anxious, frustrated, afraid, sad, stressed, angry, in pain, helpless) states (Watson et al., 1988). When these questions were combined into respective positive ($M = 71.96$, $SD = 23.95$) and negative ($M = 35.43$, $SD = 28.09$) affect scales, both showed good reliability (negative affect ICC = 0.93; positive affect ICC = 0.91) across sessions, and internal consistency (negative affect ICC = 0.87; positive affect ICC = 0.84).

Participants were audio-recorded by the smart device while completing a verbal memory task. This task required them to listen to a short story and retell it approximately 17 min later. A different story was provided for each assessment. Acoustic analysis was conducted using the Computerized assessment of Affect from Natural Speech (CANS; Cohen et al., 2010), to derive jitter ($M = 0.16$, $SD = 0.03$, ICC = 0.75), and shimmer ($M = 0.76$, $SD = 0.14$, ICC = 0.80).

A multi-level model (MLM) was constructed to test demographic and historical variables (gender, legal history, and diagnosis of psychosis) and clinician rated hostility (BPRS hostility), relative to state self-reported affect (state positive and negative affect) in predicting self-reported hostility. All variables were entered simultaneously. A second MLM tested the same static variables against state acoustic measures (jitter and shimmer) in predicting self-reported hostility. The results of the MLMs are presented in Table 1. None of the static predictors significantly contributed to the prediction of self-reported hostility in either model. Of the subjective variables, negative affect was the only significant predictor of self-reported hostility.

Increases in negative affect predict increased self-reported hostility, even after accounting for all other predictors. Of the model including objective dynamic predictors, shimmer was the only variable which significantly contributed to the prediction of self-reported hostility. Decreases in shimmer predicted increased self-reported hostility.

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Table 1
Multilevel modeling comparing static and dynamic predictors of state hostility.

Predictor	B(SE) model 1	B(SE) model 2
Demographic		
Gender	0.35 (0.25)	0.20 (0.36)
Legal history	−0.01 (0.16)	0.09 (0.22)
Lifetime psychosis	0.01 (0.30)	0.28 (0.42)
Clinician rating		
Hostility	−0.03 (0.11)	−0.01 (0.16)
Subjective dynamic ^a		
Negative affect	0.60 (0.13)*	
Positive affect	0.07 (0.14)	
Objective dynamic		
Jitter		0.02 (0.14)
Shimmer		−0.30 (0.15)*

* Indicates predictor is significant at the $p < 0.05$ level.

^a Derived from self-reported measures.

This study did have limitations including a small sample size of only 25 participants. However, each of these participants did complete multiple assessments. As well, the wording of the question assessing hostility did allow for the possibility that someone could have answered with reference to wanting to harm themselves.

The strength of dynamic predictors argues for more dynamic assessment strategies. Rather than predicting violence solely according to static variables, or clinician ratings, encouraging frequent self-assessment, either through subjective or objective measures, may identify those who can best benefit from an intervention at any given time. Targeting increased risk for hostility allows intervention early in the causal chain for violence risk. To do so, it is critical to account for the individual's current state.

Declarations of interest

None.

Contributors

Brita Elvevåg, Peter Foltz, Terje Holmlund, and Alex Cohen all were involved in the creation of the mobile assessment application. Alex Cohen and Thanh Le were involved in the collection of data. Tovah Cowan, Alex Cohen, Raymond Tucker, and Thanh Le were involved in the conception of this project. Tovah Cowan carried out the literature searches and statistical analyses, and wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

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Tovah Cowan

Thanh P. Le

Department of Psychology, Louisiana State University, USA

Brita Elvevåg

Department of Clinical Medicine, University of Tromsø, Norway

The Norwegian Centre for eHealth Research, University Hospital of North Norway, Tromsø, Norway

Peter W. Foltz

Institute of Cognitive Science, University of Colorado, USA

Raymond P. Tucker

Department of Psychology, Louisiana State University, USA

Terje B. Holmlund

Department of Clinical Medicine, University of Tromsø, Norway

The Norwegian Centre for eHealth Research, University Hospital of North Norway, Tromsø, Norway

Alex S. Cohen*

Department of Psychology, Louisiana State University, USA

Corresponding author at: Louisiana State University, Department of Psychology, 236 Audubon Hall, Baton Rouge, LA 70803, USA.

E-mail address: acohen@lsu.edu.

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