

Disorganization and timing of motor behavior: insight from gesture impairments and movement patterns in schizophrenia.

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BACKGROUND

Motor symptoms are frequent phenomena across the entire course of schizophrenia¹. Some have argued that disorganized behavior was associated with aberrant motor behavior. Furthermore, disorganization was linked to altered timing perception in schizophrenia². We aimed to determine, whether the timing of motor behavior was linked to disorganization or negative symptoms in schizophrenia. Therefore, we conducted two studies on timing of movements and disorganization: The first study³ explored the structure of movement patterns during one hour of spontaneous movements and the second study^{4,5} tested the accuracy and timing during the performance of simple hand gestures.

METHODS

Study 1

100 patients with schizophrenia spectrum disorders wore an actigraph at the nondominant arm for 24 h. One hour with comparable social program was chosen for analyses. Time series analysis was applied. Regression models determined the impact of movement pattern stability (longer autocorrelation lags) and motor activity levels on psychopathology.

Study 2

A validated test of upper limb apraxia was applied in 30 schizophrenia patients. We used standardized video assessments of hand gestures by a blinded rater. Gestures were assessed following imitation or verbal command (pantomime).

Psychopathology was assessed with the PANSS in both studies.

FIGURES

Figure 1

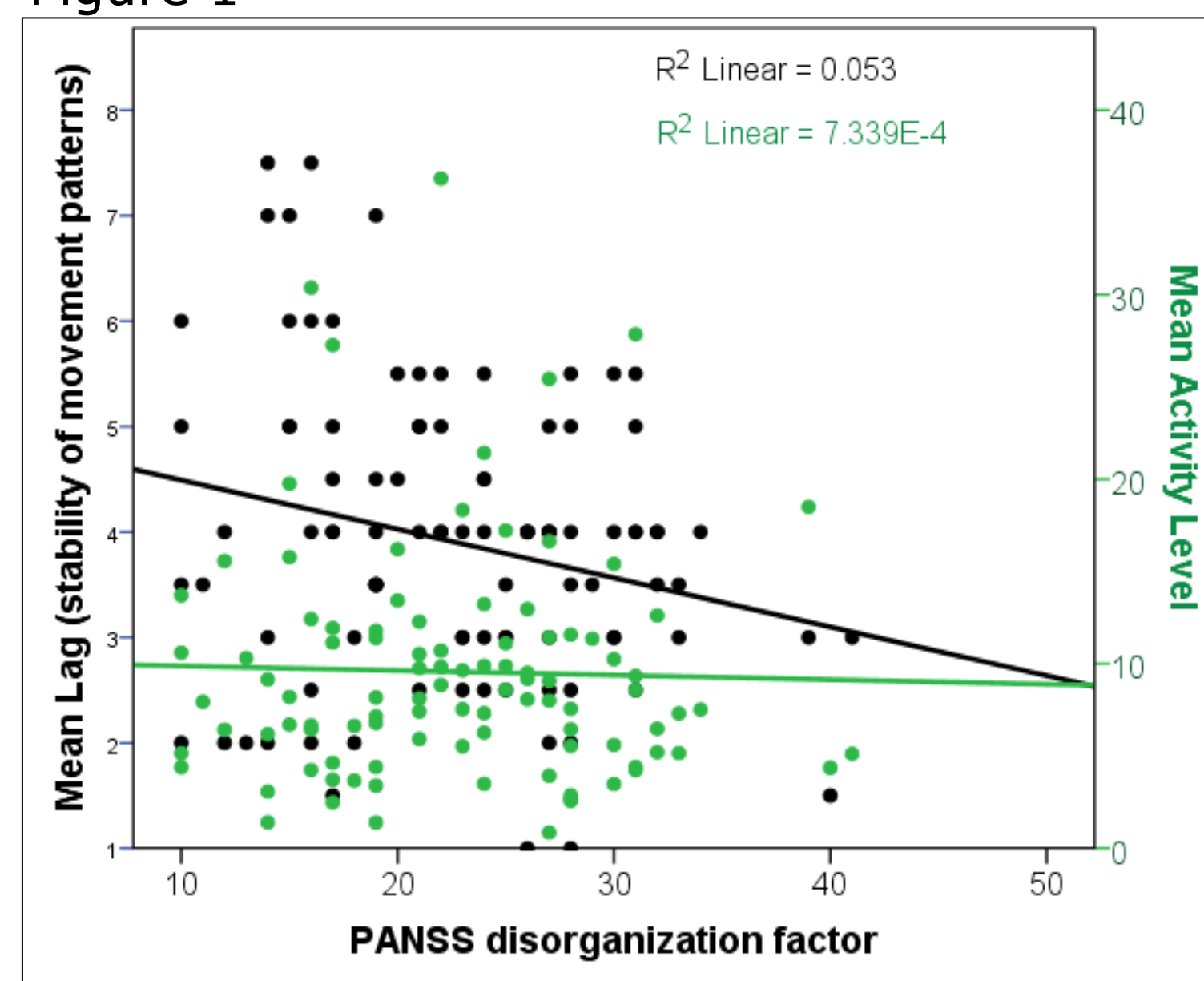


Figure 1 (left): disorganization is related to reduced stability of movement (Mean lag - black), but not to Mean Activity Level (green).

Figure 2

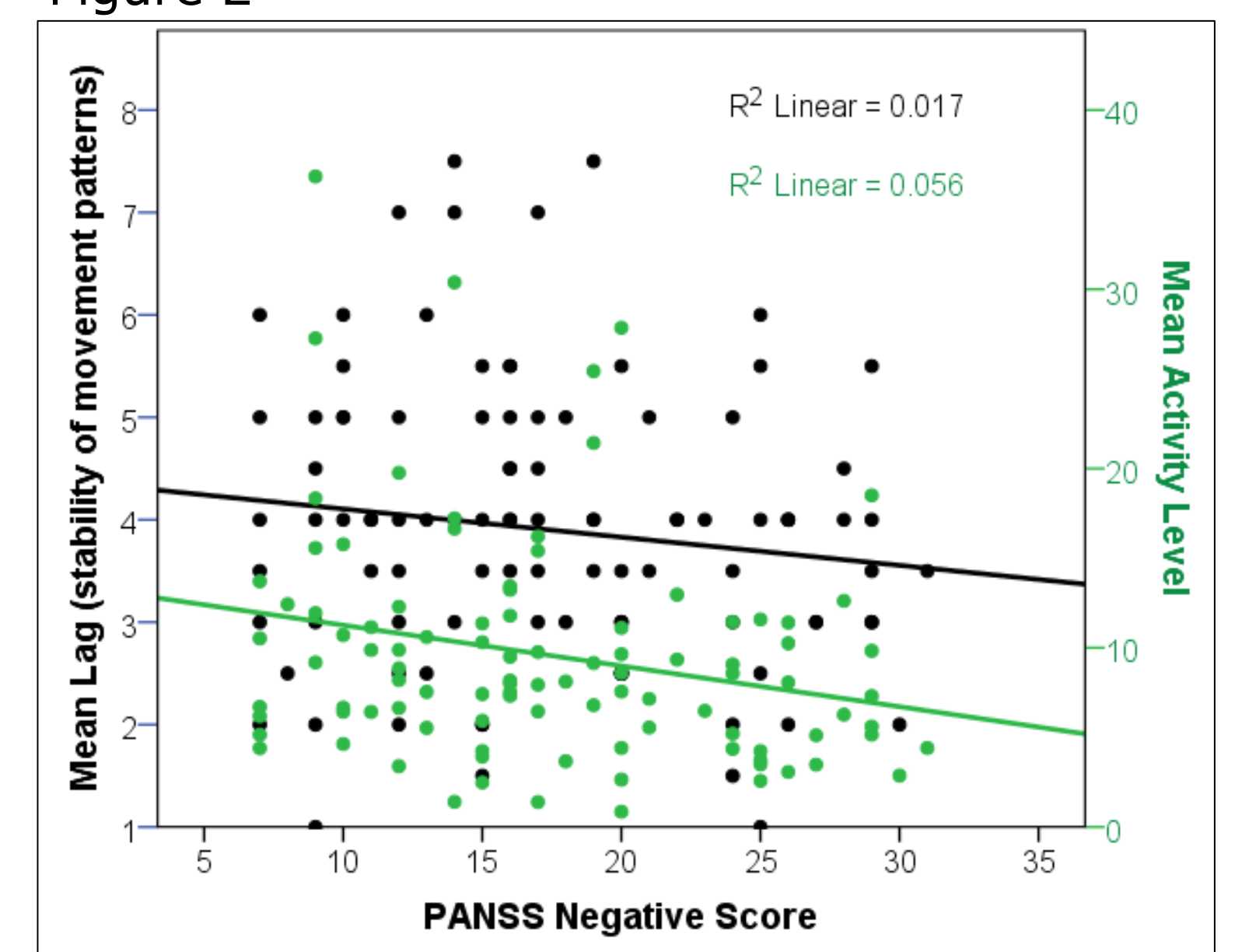


Figure 2 (right): Negative symptoms are associated with reduced Activity Level (green) but unrelated to pattern stability (black)

Figure 3

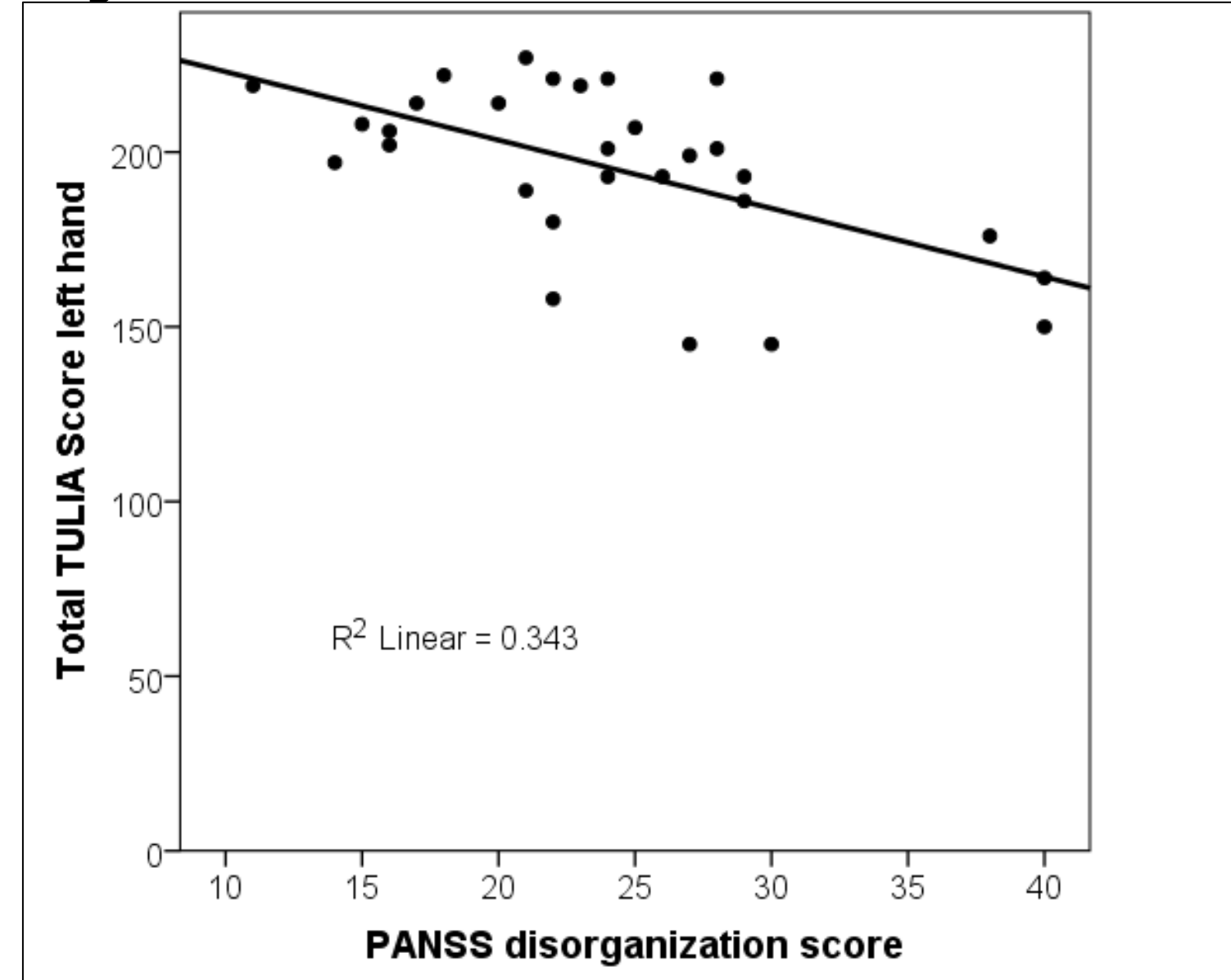


Figure 3 (left): correlation of disorganization and gesture performance

Figure 4

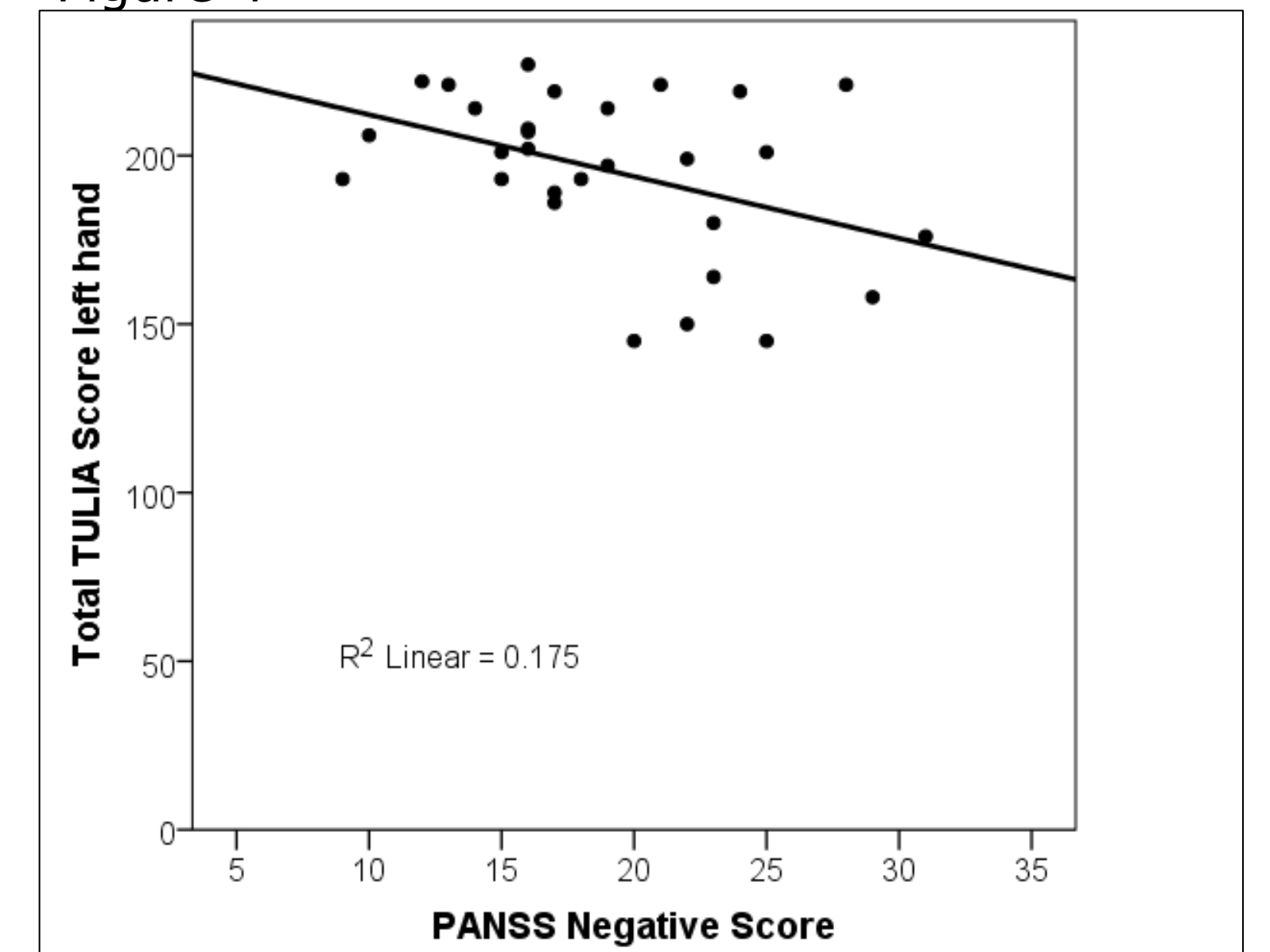


Figure 4 (right): correlation of negative symptoms and gesture performance.

RESULTS

Study 1: Disorganization ($F[2, 97] = 2.76, P = .069$) was predicted by the number of lags ($\beta = -.23, P = .022$) but not by the mean motor activity ($\beta = .02, P = .855$). In contrast, PANSS negative syndrome scores were predicted ($F[2, 97] = 3.48, P = .035$) by the mean motor activity ($\beta = -.22, P = .027$) but not by the number of lags ($\beta = -.09, P = .362$). Thus, more irregular movement patterns are associated with disorganization, but reduced overall movement is associated with negative symptoms. See figures 1 & 2.

Study 2: In total, 67% of the patients had gesture performance deficits. Most frequently, they made spatial, temporal and body-part-as-object errors. Gesture performance was correlated with disorganization ($r = -.59, P = .001$) and negative symptoms ($r = -.42, P = .024$). However, in a stepwise linear regression, only disorganization scores were kept in the model of total gesture performance ($F = 14.0, P = .001, \text{corr } R^2 = .32$). Poor hand gesture performance is linked to more severe disorganization in schizophrenia. See figures 3 & 4.

DISCUSSION

Both studies provide evidence for a link between aberrant timing of motor behavior and disorganization. Disturbed movement control seems critical for disorganized behavior in schizophrenia. Thus, disorganization is not exclusively linked to perception but also to movement plans. The behavioral correlates of disorganization are easy to assess and help to delineate effects of disorganization from effects of negative symptoms.

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